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DEVOTED TO THE INTERESTS OF TEXTILE CHEMISTRY
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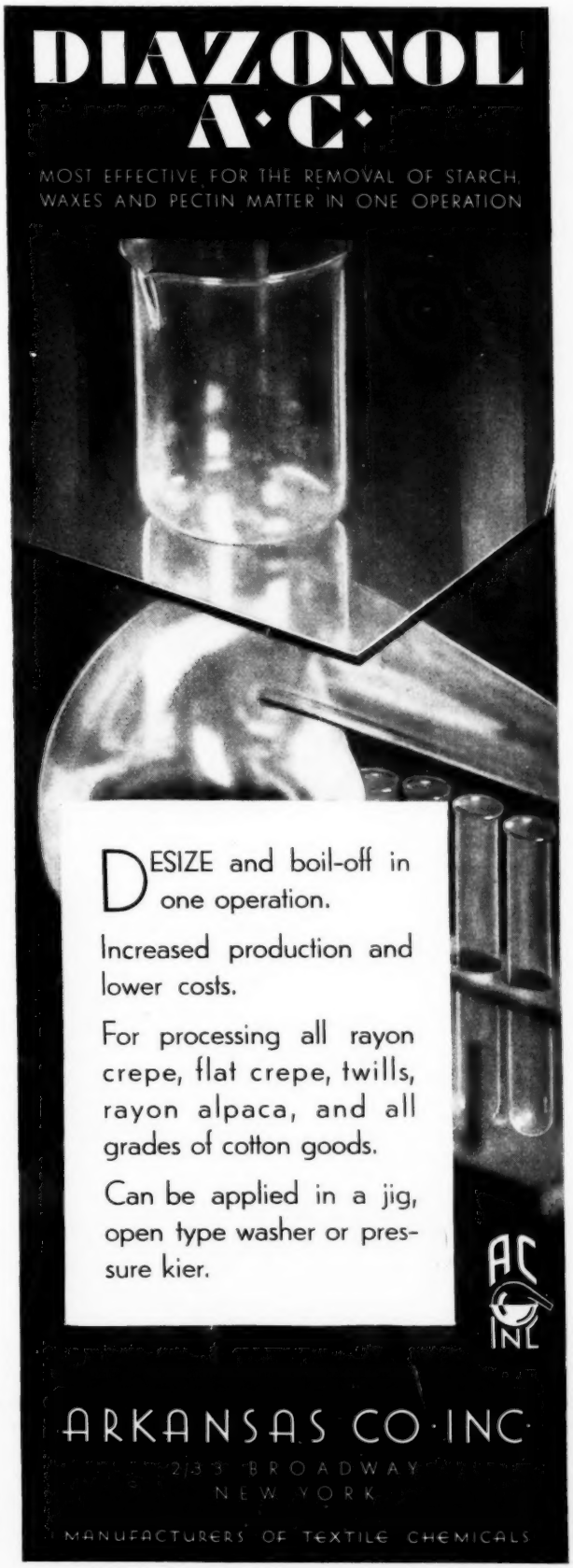
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A Rapid and Reliable Method for the Determination of Fat in Sulfonated Oils

By **RALPH HART**

The Hart Products Co.

In view of the desirability of an agreement among Textile Chemists upon a standard method for analyzing sulfonated oils this article by Ralph Hart, who originally proposed the standard methods now used by the American Leather Chemists Association, should be of interest to all textile chemists.

While the method now in use for the determination of organically combined SO_3 has been thoroughly tested during the past twelve years and conceded to be simple, accurate and rapid, the direct methods for determining fat are open to many criticisms. In view of this fact the author proposes a method for determining total fatty matter by difference. The method is theoretically sound and is based on analytical data that may be accurately determined and which is usually reported in an analysis of sulfonated oils, and replaces a long gravimetric method by one or two simple titrations. This paper will be followed, in another issue, by another article by the same author on the Determination of Inorganic Non-volatile Impurities in Sulfonated Oils.

A MOVEMENT seems to be on the way to have textile chemists agree upon standard methods for the analysis of sulfonated oils. Dr. H. Stadlinger[1]* states that there are about 25 different testing methods to determine the actual fatty matter in sulfonated oils. He also calls attention to the fact that the American Leather Chemists Association (A. L. C. A.) have been using standard methods for analyzing sulfonated oils for a number of years. Professor A. H. Grimshaw[2] proposes a system of analysis similar to that employed by the A. L. C. A. and based upon methods originally proposed by the present writer.

In Germany the "Wissenchaftlichen Zentralstelle für Oel-und Fettforschung (Wizöff)" in cooperation with the "Verband Deutscher Tuerkisch-Rotoel-Fabrikanten (Krefeld)."[3] have only this year adopted standard methods of analysis. According to their methods fatty matter is determined gravimetrically as fatty acids by extraction with ether. The organically combined SO_3 is determined either gravimetrically as $BaSO_4$, or volumetrically according to the writer's method.

Probably the two most important determinations in the analysis of a sulfonated oil are (a) the organically combined SO_3 and (b) total fatty matter. The volumetric method for the determination of combined SO_3, which is standard with the A. L. C. A., has been thoroughly tested during the past twelve years by many investigators and it is now pretty well conceded to offer a simple, accurate and rapid method.

Because no direct method for fat is available that is not open to one objection or another, the determination of total fatty matter by difference is proposed in this paper. Thus during the decomposition with acids and upon heating to constant weight, the fat is subject to hydrolysis, polymerization, oxidation, to the formation of lactones and anhydrides, to volatility losses, etc., all affecting the accuracy of the determination.

No such objections can be raised against the proposed method-by-difference which depends upon several tests that may be determined accurately. The result also expresses the fat in the form that it actually exists in the original oil, minus its inorganic constituents. This definiteness already clarifies the problem considerably. Furthermore, the lengthy gravimetric analysis is replaced by one or two simple titrations requiring little time to carry out.

Procedure

The following analytical data are necessary to find the total fatty matter by the new method.

1. Total alkalinity (At).
2. Fixed alkalinity (Af).

*Numbers refer to references in Bibliography at end of article.

3. Organically combined sulfuric anhydride (S).
4. Water.
5. Ash.

It will be observed that the alkalinities are the only extra determinations—the other tests must obviously be included in any system of analysis of sulfonated oils. In the absence of ammonia Af = At and hence only one alkalinity test need be made. The following procedure for making the above tests are taken partly from the article by Professor Grimshaw already mentioned:

1. Total Alkalinity (At).

This test measures the amount of fatty acids bound as soap and is made by titrating a water solution of the oil in presence of methyl orange.

Procedure—Ten grams of the oil in an Erlenmeyer flask is dissolved in 100 cc. of water and the solution titrated with N/2 H_2SO_4. The end-point may be made more distinct by adding salt and ether (see 3 below). The formula is as follows (titre and titrations in mgms. KOH per cc. or gram):

$$\text{Total alkalinity (At), mg. KOH per gram} = \frac{\text{cc. } H_2SO_4 \times \text{Titre } H_2SO_4}{\text{Sample}}$$

$$\text{Example: Total alkalinity} = \frac{15.9 \times 28.1}{10} = 44.7 \text{ mg. KOH per gram.}$$

2. Fixed Alkalinity (Af).

This determination corresponds to the fat bound as soda soap and in the absence of ammonia is identical with total alkalinity. In the presence of ammonia, however, a separate determination is necessary. The ammonia is first removed by boiling with a definite amount of standardized caustic soda and the excess alkali is then titrated with acid.

In case the oil has been neutralized with ammonia only, it evidently will contain no fixed alkali and the result is therefore zero. Moreover, part of the organically combined SO_3 may also be neutralized with ammonia, causing upon boiling with the caustic an absorption of the latter that cannot be titrated. In that case the fixed alkali is negative. The sign, however, is automatically taken care of by the formula and it should be carefully retained for use in subsequent calculations.

Procedure—Ten grams of oil is dissolved in 100 cc. of water in a 500 cc. beaker, 25 cc. of N/2 NaOH added, and the solution gently boiled until wet litmus paper no longer indicates ammonia. It is finally titrated with N/2 sulfuric acid in the presence of methyl orange. From this data, the fixed alkalinity is calculated as follows:

$$\text{Fixed alkalinity (Af) mg. KOH per gram} = \frac{(\text{cc. } H_2SO_4 \times \text{Titre } H_2SO_4) - (25 \times \text{Titre NaOH})}{\text{Sample}}$$

Example:

$$\text{Fixed alkalinity} = \frac{(23.0 \times 28.1) - 25 \times 27.6}{10.1} = -4.33 \text{ mgs. KOH per gram.}$$

3. Organically Combined Sulfuric Anhydride (S).

The volumetric method—which, by the way, has the endorsement of K. H. Bauer, professor at the University of Leipzig, and an authority on oils and fats—depends on the decomposition of the sulfonated oil upon boiling with a definite amount of standardized sulfuric acid, thereby increasing the acidity of the solution due to the liberated organically combined sulfur trioxide. The increase in acidity, which can readily be ascertained by analysis, was found to correspond quantitatively to the combined SO_3, and hence can be used to calculate the latter. The change that takes place upon boiling with acid is represented by the following equation:

$$2NaSO_3OC_{17}H_{33}.\ CO_2Na + H_2SO_4 + 2H_2O = Na_2SO_4 + 2NaHSO_4 + 2HOC_{17}H_{33}.\ CO_2H$$

That is, for every molecule of combined sulfur trioxide there is liberated one hydrogen equivalent of mineral acid ($NaHSO_4$).

Procedure—Ten grams of the sample is weighed into a 300 cc. Erlenmeyer flask provided with a reflux condenser and boiled for one hour with 25 cc. of 1 N sulfuric acid, using glass beads to prevent bumping, and shaking frequently. The condenser is washed into the flask, 30 grams granulated salt and 100 cc. of water are added, and the mixture is cooled; 20 cc. ether and methyl orange indicator are now added, and the contents are titrated with N/2 caustic soda.

The purpose of the salt and ether is to overcome the occasional difficulty of titrating a milky or turbid solution, for the ether extracts the fat, and the salt solution causes a rapid separation of the layers, enabling the titration to be carried out in the lower water layer which remains clear.

The organically combined SO_3 is calculated according to the following formula:

$$\text{Combined } SO_3, \text{ per cent (S)} = \left\{\frac{(\text{cc. NaOH} \times \text{Titre NaOH} - 25 \times \text{Titre } H_2SO_4) - \text{At}}{\text{Sample}}\right\} \frac{8}{56.1}$$

Where At = total alkalinity.

Example: Combined SO_3 =

$$\left\{\frac{(45.5 \times 27.6 - 25 \times 56.3) + 44.7}{10.1}\right\} \frac{8}{56.1} = 4.23\%$$

4. Water.

The method for determining water is taken from the official methods of the A. L. C. A.

Procedure—Weigh between 30 to 40 grams of the sample (depending upon the amount of water present) into a flask of 250 to 300 cc. capacity and add 75 cc. water-saturated xylol, prepared by heating a mixture of water and xylol with frequent shaking and subsequently removing the water in a separatory funnel. Connect to a condenser and place flask in a bath of paraffin or

heavy lubricating oil. Distill moderately until the distillate comes clear. Collect distillate in a tube graduated to 1/10 cc. and wash out the condenser with xylol, collecting washings in the receiver also. Place graduated receiver in hot water and when the distillate is clear, cool. The percentage of moisture is obtained by dividing the cubic centimeters of water in the distillate by the grams of oil taken. (Bidwell and Sterling moisture apparatus manufactured by Eimer & Amend may be used for this test.)

$$\text{Water, per cent} = \frac{\text{cc. } H_2O}{\text{Sample}} \times 100$$

$$\text{Example: Water} = \frac{5.40 \times 100}{21.0} = 25.7\%$$

5. Ash.

This determination is necessary in order to find the inorganic impurities and is carried out according to the A. L. C. A. official method.

Procedure—Weigh a convenient quantity (from 5 to 10 grams) into a crucible or dish. Ignite gently, allow the oil to burn, and complete the incineration at a dull red heat until all carbon is consumed.

$$\text{Ash, per cent} = \frac{\text{Weight Ash}}{\text{Sample}} \times 100$$

$$\text{Example: Ash} = \frac{0.208}{5.2} \times 100 = 4.0\%$$

Calculations

For the purpose of the method, sulfonated oils may be considered to consist of the following ingredients:

1. Organically combined SO_3, neutralized with soda or ammonia, or both.
2. Sodium as soap.
3. Ammonia as soap.
4. Inorganic impurities.
5. Water, and finally
6. Fatty matter.

Obviously to find the last all the other items must be accurately known. With the exception of "water," which is determined directly, the other items may readily be calculated from the above data by means of the following formulas:

(a) Neutralized organically combined SO_3 (as sodium salt), per cent = 1.49 S.

Example: Neutralized organically combined SO_3 = 1.49 x 4.23 = 6.30%.

(b) Sodium as Soap, per cent = 0.041 Af.

Example: Sodium as Soap—Since fixed alkalinity is negative there can be no soda soap present.

(c) Ammonia as soap:

(1) When Af is positive, per cent = 0.0322 (At — Af).

(2) When Af is negative, per cent = 0.0322 At.

Example: Ammonia as soap = 0.0322 x 44.7 = 1.44%.

(d) Inorganic impurities:

(1) When (Af — 7S) is negative, per cent = % Ash — 0.1268 (7S + Af).

Example: Inorganic impurities = 4.0 — 0.1268 [7 x 4.23 + (—4.33)] = 0.79%.

(2) When (Af — 7S) is positive, per cent = % ash — 0.0946 — (11.77S + Af).

In the case where only ammonia has been used for neutralizing, the formula for the neutralized SO_3 may not be entirely correct, as part of the sodium is probably replaced by ammonia. In the writer's experience, however, the sulphate group of every commercial sulfonated oil is practically all neutralized by the salt used in washing the oil free of excess acid. Furthermore, the error introduced by assuming all sodium even where ammonia might be present, is small as the difference in the molecular weights between them is not large and has only a small effect on the factor. If greater accuracy is desired, however, the SO_3 neutralized with ammonia may be separately calculated.

The per cent total fatty matter is obviously the difference between 100 and the sum of neutralized organically combined SO_3, sodium or ammonia as soap, inorganic non-volatile impurities and water:

Total fatty matter, per cent = 100 — (a + b + c + d + water).

Example: Total fatty matter = 100 — (6.30 + 0 + 1.44 + 0.79 + 25.7) = 65.8.

Foreign materials added to the oil may interfere with the new method in which case special methods of analysis are required any way. To detect such additions, however, the saponification value of the fatty matter may be calculated by determining the saponification number of the original oil and the alkalinity of the soap, or one of the gravimetric methods may be used as a check.

The method of calculations as here outlined was applied to a number of analyses of sulfonated oils published by Dr. C. G. Bumcke[4] who used the ether extraction method for fat determination. He reports sufficient data to make possible the calculation of fatty matter by the new method. The data by Bumcke and the results by the two methods are given in Table I. It will be noticed that the average difference in fatty matter is about 0.5%, with a tendency of slightly higher results by the new method.

Table I—Fat-by-Difference Compared With Extraction Method

	No. 3 %	No. 4 %	No. 7 %	No. 10 %	No. 13 %
Water	25.13	29.45	19.75	53.36	16.04
Neutralized combined SO_3	2.91	2.85	2.86	3.94	2.98
Ammonia as soap	0.11	0.06	0.00	0.01	0.00
Sodium as soap	0.11	0.29	0.74	0.18	0.14
Inorganic impurities	0.86	1.57	0.67	3.25	0.17
Unsaponifiable	....	....	1.35	0.58	31.55
Total	29.12	39.22	25.37	61.32	50.88
Fat-by-diff., new method	70.88	65.74	74.63	38.68	49.12
Fat, extraction method (C.G.B.)	70.14	65.31	74.75	38.64	48.21
Difference	—0.74	—0.47	+0.12	—0.04	—0.91

Conclusions

A method for determining total fatty matter in sulfonated oils by difference is proposed. The method is theoretically sound; it is based on analytical data that may be determined accurately and which furthermore are usually reported in an analysis of sulfonated oils; and finally it replaces a long gravimetric analysis by one or two simple titrations.

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[1] Standard Testing Methods for Turkey Red Oil and Similar Textile Oils, H. Stadlinger, The Melliand, Vol. 2, p. 1560 (1931).

[2] Analysis of Sulfonated Oil, Albert H. Grimshaw, Textile World, Vol. 39, p. 1212 (1931).

[3] Vorschlage einheitlicher Prufverfahren fur Turkischrotole und Turkischrotolartize Produkte (Vizoff), Chem. Umschan, Vol. 38, p. 34 (1931).

[4] Analysis of Sulfonated Oils, J. Am. Leather Chem. Assn., C. G. Bumcke, Vol. 14, p. 515 (1919).

Programs for Thirteenth Exposition of Chemical Industries

The Thirteenth Exposition of Chemical Industries will be held in the Grand Central Palace in New York during the week of May 4th to 9th, 1931, and final details of all programs are rapidly taking shape. Fred A. Koch of Dow Chemical Company, President of the Salesmen's Association of the American Chemical Industry, has announced that the Chemical Industry Dinner, sponsored by the organization during the week of each Chemical Exposition, this year has been scheduled for Thursday evening, May 7th, and will probably be held at the Roosevelt Hotel. As usual, the principal speaker will be a prominent individual whom it will be well worth to hear. This dinner always attracts a larger gathering than any other in the chemical field. About twenty of the industry's most active associations, including most of the technical organizations, will co-operate with the Salesmen's Association in urging all of their friends and members to attend this regular feature of Chemical Show week.

The success of these dinners is due primarily to the immense throng of men prominent in the chemical industries who are regularly attracted by the Exposition. The great diversity of exhibits of raw materials, laboratory and plant equipment and finished products of the 40-odd chemical industries always assembled at these Expositions has no counterpart elsewhere in the world; and the numbers of chemists and engineers, plant executives and officers of great corporations that come from all parts of the country as well as from the industrial nations of the world, is correspondingly impressive.

They come to keep in close touch with what their industry is doing, to compare competitive equipment which can be used in their plants, and in search of solutions for vexing problems of production. A vast array of equipment is on hand for examination.

Equipment to be shown will range from the most delicate laboratory and scientific instruments up to massive industrial apparatus such as beaters, crushers and pulverizers. One booth will include: a rapid vacuum and pressure pump with a range from a pressure of 20 pounds per square inch down to a vacuum of one ten-millionth of an atmosphere; laboratory balances designed for fast weighing without sacrifice of accuracy, and sensibility of .001 mg, viscosity meters; a surface tension balance; a new Hoag-Millikan Oil Drop Apparatus, and a considerable list of other scientific instruments.

Besides the exhibits, the Students' Courses always given at the Expositions have come to be recognized as one of their most important features. These courses are under direction of Dr. W. T. Read, and a preliminary announcement from Dr. Read gives brief synopses of the three courses for the coming Exposition. The lectures of the first course will extend through Monday afternoon and Tuesday morning; the other two courses will extend through the mornings.

The purpose of the first course, which will be given the afternoon of May 4th and the morning of May 5th, is to give a general survey of the field of chemical engineering. It is intended for students who are beginning their work in chemical engineering but who have had none of the formal courses in the subject, and for students who are interested in the chemical industry and have not yet made final decision as to their future course of study.

The second course, to occupy the mornings of May 6th and 7th, is for advanced students of chemical engineering and for younger chemical engineers in industry. Its purpose is to impart the point of view held by progressive leaders in this field.

The third course will fill the mornings of May 8th and 9th, and is designed for students of chemistry, including advanced undergraduates, graduate students and younger chemists who are still under training in chemical industry.

It is expected that students attending these courses will give close study to exhibits in any way related to their courses, or to their plans for the future, and many of them will there become acquainted for the first time with products and equipment which they may later be called upon to handle on the job.

1931 Fall Woolen Colors

Meetings for the selection of Fall and Winter woolen colors have been in progress for several weeks, it was announced recently by Margaret Hayden Rorke, Managing Director of the Textile Color Card Association.

Mrs. Rorke stated that the woolen committee conferred and would continue to meet two or three times a week until the choice of colors was completed.

In advance of the issuance of the Fall 1931 Woolen Card, the Textile Color Card Association will send out confidential swatches of generous size to its members in the woolen industry.

A close coordination will be maintained between the woolen and silk shades, which will serve as foundation for the later selection of shoe and leather and hosiery colors, as well as the basic shades to be chosen by a number of the trade groups.

Proceedings of the American Association of Textile Chemists and Colorists

The American Association of Textile Chemists and Colorists

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CALENDAR OF COMING EVENTS

Council and Research Committees—
May 15—Boston.

* * *

Annual Meeting
December 4, 5—Boston.

* * *

Exhibition of Color at the Museum of the Peaceful Arts, 220 East 42nd Street, New York. Starts January 2nd and continues several months.

* * *

New York Section Meetings—
May 22—Paterson.

* * *

Northern New England Section Meetings—
May 2.

COMMITTEES FOR ANNUAL MEETING

The Sectional Committee of the Northern New England Section, which will have charge of the Annual Meeting next fall, met recently in Boston with the Chairman of the National Convention Committee, H. R. Davies, and appointed committees which will have charge of arrangements for the 1931 Annual Meeting which will be held at Hotel Statler, Boston, December 4th and 5th.

The committees named are as follows:

General Committee—H. R. Davies, Chairman; W. R. Moorhouse, Treasurer; A. H. Sampson, Secretary, and L. A. Olney.

W. H. Zillessen, Chairman Dining & Entertainment; Henry Grimes, Chairman Publicity; John Grady, Chairman Transportation and Sight Seeing; Alex. Morrison, Chairman Registration; Roland Derby, Chairman Reception.

Reception Committee—Roland Derby, Chairman; Provisional, W. M. Scott, Harold Leitch, Dave Searle, Frank Flemming, P. J. Collins, Walter Haskell, Geo. Lindberg.

Registration Committee—Alex. Morrison, Chairman; C. Nutting, W. M. Sullivan.

Publicity Committee—Henry Grimes, Chairman; A. P. Howes and Secretaries of all Local Sections.

Dining and Entertainment Committee—W. H. Zillessen, Chairman; A. H. Sampson, Ray Caffrey, Hugh Christison.

Transportation and Sight Seeing Committee—John Grady, Chairman; Provisional, John Dalton, M. J. Lane, W. E. Lincoln, Dr. Rupp, Harold Gile, B. Proctor, W. Allen, Phil Graham.

SEVENTY-SECOND COUNCIL MEETING

THE Seventy-second Council Meeting of the American Association of Textile Chemists and Colorists was held at the Engineers' Club, Boston, Mass., Friday, March 20, 1931, at 1:45 P. M.

The following were present:

President: P. J. Wood
Treasurer: Harry R. Davies
Councillors: Hugh Christison
Wm. R. Moorhouse
Ralph F. Culver

Councillors
ex-officio: Henry D. Grimes, Chairman, Northern New England Section.
Dr. D. H. Powers, Chairman, Rhode Island Section.
Dr. Carl Z. Draves, representing C. A. Seibert, Chairman, Philadelphia Section.
Prof. L. A. Olney, Chairman, Research Committee.
Secretary: Alex. Morrison.

Letters expressing regrets at inability to be present were received from Vice-President H. A. Barnes, Samuel L. Hayes, Chairman, Piedmont Section, and C. A. Seibert, Chairman, Philadelphia Section, the latter requesting that Dr. Carl Z. Draves be his representative.

The Secretary's balance sheet was read as follows and approved:

Secretary's Balance Sheet—March 19, 1931

Cash on Hand February 26, 1931		$1,221.16
Receipts to March 18, 1931, Incl.:		
Applications, 10 @ $5.00		50.00
Dues, 1930 1 @ $5.00		5.00
Dues, 1931 67 @ $5.00		335.00
Dues, 1932 1 @ $5.00		5.00
Year Book Sales, 6 @ $3.00		18.00
Year Book Sales, 8 @ $2.00		16.00
1 Pin		1.50
Howes Publishing—Reporters		1.50
		$1,653.16
Disbursements:		
Feb. 27—To Treasurer—Research Fund	$200.00	
Feb. 27—To Treasurer—General Fund	900.00	
Mar. 18—To Treasurer—General Fund	400.00	
Mar. 4—Exchange Charge	.25	
Cash on Hand—Andover National Bank	149.91	
Cash on Hand	3.00	
		$1,653.16

The Treasurer's report was read as follows and approved:

GENERAL FUND

Balance as reported Feb. 26, 1931	$5,706.79	
Received since Feb. 26, 1931	1,300.00	
	7,006.79	
Expenditures since Feb. 26, 1931	57.97	
Balance		$6,948.82

RESEARCH FUND

Balance as reported Feb. 26, 1931	$4,357.75	
Received since Feb. 26, 1931	200.00	
	4,557.75	
Expenditures since Feb. 26, 1931	250.00	
Balance		$ 4,307.75
Total Balance		$11,256.57
Savings Bank Account — First National Bank	$6,431.21	
Checking Account — First National Bank	4,825.36	
	$11,256.57	

The following were elected to membership in this Association as of a date thirty days after publication of their names provided no objection is registered with the Secretary in regard to any of them:

ACTIVE:

Fallstrom, Iver W.—Lisbon, Conn. Chief Chemist and Purchasing Agent, The Aspinook Company, Jewett City, Conn.

Nield, Harry O.—64½ Whittier Ave., Providence, R. I. Foreman Dyer, National & Providence Worsted Mills, Providence, R. I.

Schroeder, Harold—202 Morningside Drive, Chattanooga, Tenn. Textile Chemist and Dyer, Dixie Mercerizing Co., Chattanooga, Tenn.

Sowinski, Edward—312 West 31st St., Chicago, Ill. Hosiery Dyer, Paris Dyers & Cleaners, Chicago, Ill.

JUNIOR:

Hoffmann, Edward G.—341 East 90th St., New York, N. Y. Colorist, General Dyestuff Corp., 230 Fifth Ave., New York, N. Y.

Holden, John—82 Putnam Ave., Graniteville, R. I. Student, Esmond Mills, Esmond, R. I.

Sauter, F. Albert—20 Hackett Place, Rutherford, N. J. Student, Textile Building, Clemson College, S. C.

Spurr, Emery D.—129 Westford St., Lowell, Mass. Dyer, Hub Hosiery Mill, Lowell, Mass.

ASSOCIATE:

Fanning, Emory M.—16 Appleton St., Watertown, Mass. Sales, E. I. du Pont de Nemours & Co., Dyestuff Dept., 140 Federal St., Boston, Mass.

North, Louis A.—Ansley Hotel, Atlanta, Georgia. Chemical and Dyestuff Salesman, American Aniline & Extract Co., Venango and F Sts., Philadelphia, Pa.

Schier, C. A.—General Manager, Burkhardt Schier Chemical Co., 1206 Chestnut St., Chattanooga, Tenn.

Schmid, G. W.—175 Columbia Ave., Cranston, R. I. Salesman, Newport Chemical Works, Inc., 32 Custom House St., Providence, R. I.

The request from the Smithsonian Institute for an exhibition was again considered and it was voted that such an exhibition as wanted was not a function of our Association, and the Secretary was instructed to write to this effect to the Institute.

Hugh Christison, Henry D. Grimes, and Dr. Walter M. Scott, Auditing Committee, reported on the audit of the accounts of the Treasurer and Secretary as follows:

"The committee appointed by President Killheffer to audit our Society's books met and examined the books of the Treasurer and Secretary. The only difficulty we encountered was the same as the professional auditors, that is, we could not check the receipts without writing or seeing each member. But, members paying dues should receive the journal and would complain if they did not. We compared each voucher with the check book stub and the cancelled check and verified the totals. We were furnished with certificates of deposit by the First National Bank of Boston on both checking and savings accounts. We examined the books of the Secretary and his bank statements and checks. The books of the Secretary and Treasurer are kept in an orderly and business-like way. We believe them to be correct."

Dr. Walter M. Scott, Chairman of the representatives of our Association to the preliminary conference to consider the organization of an inter-society committee on color specifications was read as follows and accepted:

"A report of the preliminary conference to consider the organization of an inter-society committee on color specifications.

"The meeting was held at the Museum of Science and Industry in New York City on February 26, 1931. Meeting called to order at 8 P. M. by Loyd A. Jones, President of the Optical Society of America. M. Rea Paul of the National Lead Company acted as secretary pro tem. The representatives of about fifteen societies and associations were present as well as a number of individuals who received special invitations because of their known interest in color.

"There was a very general discussion of the merits of the proposed organization and of the ways and means by which it could be brought into being. There seemed to be practically a unanimous agreement that a permanent color conference of some sort would be very useful as a medium for the interchange of ideas on color and for promotion of color standardization.

"A resolution was finally passed to the effect that the meeting was in favor of the formation of an Inter-Society Color Council to be composed of delegates appointed by national societies and associations interested in the description, specification and standardization of color. The delegates who were present at this preliminary conference were requested to report the above resolution to the president and executive committee of their respective societies or associations and request that permanent delegates be appointed to co-operate in the formation of the Inter-Society Color Council. It was the sense of the meeting that the number of delegates from each society or association should not be limited but that each society or association should be entitled to only one vote in the Inter-Society Color Council.

"Loyd A. Jones was authorized to call an organization meeting of the Inter-Society Color Council as soon as he receives notice of the appointment of official delegates from a sufficient number of societies and associations."

Dr. Walter M. Scott, Chairman, Dr. Carl Z. Draves and Wm. D. Appel were elected permanent delegates, representing our Association, to a meeting in May for the purpose of forming an Inter-Society Color Council.

Prof. Olney reported for himself and Dr. Scott, the committee appointed at the last meeting to submit a rotating schedule for Annual Meetings, as follows:

SUGGESTED SCHEDULE FOR THE ANNUAL MEETINGS OF THE A.A.T.C.C.

1. The schedule of rotation for New England and the Middle Atlantic States shall be
   Northern New England Section
   New York Section
   Rhode Island Section
   Philadelphia Section
2. The schedule of rotation for the other sections shall be
   South Central Section
   Midwest Section
   Piedmont Section
3. An annual meeting shall be held in some section of the second group every third year.
4. On this basis the schedule beginning with the year 1930 will be as follows:
   1930 South Central
   1931 Northern New England
   1932 New York
   1933 Midwest
   1934 Rhode Island
   1935 Philadelphia
   1936 Piedmont

1937 Northern New England
1938 New York
1939 South Central
1940 Rhode Island
1941 Philadelphia

The report was accepted as a tentative schedule for Annual Meetings to be definitely acted upon at a subsequent meeting.

A Research Questionnaire from the U. S. Institute for Textile Research, Inc., was referred to Prof. Olney, as Chairman of Research Committee, to be filled out.

Prof. Olney reported for the Research Committee that Dr. Milton Harris has been engaged as Research Associate, to commence work April 1st, 1931, and Bertyl A. Rybergh had been engaged as Research Assistant, and had started work at Lowell Textile Institute March 7, 1931.

The next Council Meeting, scheduled for New York April 10th was changed to April 17th.

The Technical Program Committee for the Annual Meeting reported progress already made.

The meeting adjourned at 2:45 to meet in New York April 17th, 1931.

Respectfully submitted,

ALEX. MORRISON,
Secretary.

Textile Fabrics for Military Purposes*

By 1ST LIEUTENANT H. KIRSNER

WHEN I received the request of your Mr. Bertolet, to talk to you gentlemen on textiles and their coloring or on a subject akin to textiles, after some thought I selected my subject as "Textile Fabrics for Military Purposes." Undoubtedly, you will wonder why the subject should not have been Textile Uniform Fabrics or perhaps Dyestuffs, in which I know you are particularly interested. However, I believe that my selection of this subject will better develop the problem of coloring and dyestuffs than if I merely confined my remarks to uniform fabrics.

Uniform fabrics, as you well know, are not used solely for military personnel. When we speak of "uniforms," we immediately think of clothing of similar design made of cloth of like construction and color worn by personnel of military as well as civilian and semi-civilian organizations, such for instance as police forces, fire departments, postal departments, fraternal orders and others. While, generally speaking, the manufacture of uniform fabrics follow closely requirements of fabrics for military use, yet manufacturers supplying these fabrics can be said to be not as particular and painstaking as in the manufacture of similar cloths for military purposes.

The reasons for stressing uniformity in the manufacture of cloth for military purposes are many. In the first place, a much better opportunity is afforded for making closer comparisons by the military than by civilian or semi-civilian organizations. Military organizations are assembled more frequently and in larger units and the clothing inspection of these units is a requirement. Color is one of the first comparisons that inspecting officers will make, as the eye can measure color more closely than any known machine so far devised. Of course, the acceptable degree of uniformity of color largely depends on the personal equation of the inspecting officer; that is, whether or not the officer is particularly color conscious, or rather, whether or not color is a particular hobby of the inspecting officer.

Second, uniforms manufactured for military purposes are in most instances not used immediately after manufacture, while those manufactured for uniformed civilian organizations are used immediately and in this way the storage factor is of no importance to the latter while it has a decided bearing on the uniformity of the former. The stock carried by manufacturers supplying uniforms for civilian organizations is generally limited to not more than what is required for a three to six months' supply.

Third, when civilian or semi-civilian organizations turn out for inspection, you will find that most of the uniforms are new and of recent manufacture; certainly, the uniforms are not more than one year old. All the members of the organization inspected being from one locality, the chances are that they were all supplied by one uniform house, which in turn purchased the cloth from one manufacturer. The problem of obtaining uniformity in the quality of the material as well as the color is then a simple matter as compared with the procedure followed in supplying cloth for military purposes when the following is considered.

Military organizations will have in their assembled units, persons who have perhaps joined the organization as recently as one day or longer. It is safe to say that the whole organization, whether it be a company of a hundred men or a regiment of say twelve hundred men, will seldom have more than fifty per cent of their number, men who have been with the organization a year or longer, the balance being recruited either by new men or by transfer from other organizations throughout the country and when such personnel are transferred, their uniforms are of course transferred with them. Again, uniforms supplied to military personnel are very seldom made on order for the particular individual, but rather

*Synopsis of address delivered on January 30, 1931, to the Phila. Section.

are drawn from a common supply depot having stock sizes which have been in storage for a considerable time.

The purchasing of textiles that enter into the manufacture of military uniforms in the United States is done on sealed bids and the contract is given to the lowest bidder complying with all the conditions of the sealed bid. In most instances, the quantity of cloth to be purchased is large and the competitive conditions are such that it invariably results in the splitting up of the quantity among various manufacturers and when the cloth is received at the clothing manufacturing depot it is amalgamated into a common stock from which the uniforms are manufactured.

Note here the difference in the mode of manufacture between civilian uniform tailors as against military tailors: In the case of the civilian tailor, when he makes uniforms for a uniformed organization the tailor will proceed in the same manner as for an individual and he will invariably cut the suit out of one bolt of cloth, resulting in the finished uniform being of like color and quality. Whereas, tailoring for the military service, an order for the manufacture of uniforms in a quantity ranging from 25,000 upward may be received at one time. The procedure in this case is different. The first steps would be to lay, cut and make one size of one component of the uniform, which may be the coat or the breeches, and this out of whatever cloth may be first drawn from stock. The cloth may or may not be from one manufacturer. When all the uniforms are made up, instead of packing them by suits, they are usually baled or packed separately; for instance, 45 pair breeches or 60 pair trousers or 36 coats to a bale. When a requisition is received from a particular organization or supply officer for so many hundred or thousand uniforms, then the supply depot will withdraw from stock the required number of bales of each of the sizes and ship them to the various destinations. In fitting the soldier, the officer in charge will extract the size breeches and the size coat that the soldier's measurements indicate that the soldier will wear and usually two garments made from cloth produced by different manufacturers will be issued to him. Hence, immediately a slight difference in color between the coat and breeches can be noted by the critical eye and perhaps as slight difference in the quality which may be solely due to the difference in the manufacturing methods between the two manufacturers who were the original suppliers of the cloth.

The foregoing is related to you, gentlemen, for the purpose of acquainting you with the factors which tend to make the military uniforms the least uniform in color and quality in so far as the individual is concerned.

As to the question of color—in the case of uniform fabrics, certain colors or combinations of colors may be satisfactory for certain localities. This, as you well know, may be due to the climatic conditions of the particular locality where the cloth is used and while, generally speaking, no particular study is made by manufacturers as to what colors will be the fastest for certain localities, yet the inevitable economical process had a weeding-out effect which eventually found its level and fixed certain cloths for certain localities by the mere subconscious preference given it by the consumers. Whereas, for military purposes the soldier has little or no voice as to his preference, and this rightly so since his preference would change as often as his military orders would change his locality. Therefore, military fabrics have to be colored to a better extent than ordinary uniform fabrics and the coloring at best is a compromise covering the climatic conditions of all the territories wherein the military personnel for whom the textiles are purchased are located.

Take for instance the coloring for woolens: In a good many wool fabrics for certain localities acid colors have proven themselves to be quite satisfactory while in other localities, alizarine colors were found perhaps more satisfactory than the acid colors. Usually, chrome colors are used and in their application it is very seldom that a top and bottom chrome is given the fabric, but in an effort to gain the desired fastness of color for military use, it is always necessary, and it is usually precribed, a top and bottom chroming, and this with the sole idea of obtaining the best the market has available for the purpose.

In fancy woolens used for decorative purposes, from time immemorial, cloth dyed with acid colors were and are used. This because acid colors have the greatest brightness and when a bright blue or green is wanted, the easiest way for the manufacturer to obtain this brightness is by the use of an acid dye and piece dyeing.

While this was found to be satisfactory when no one ever thought of attempting to obtain something better, the idea of changing the decorations on uniforms, particularly for military use, on account of fading of color, was very much discouraged; that is to say, the consumer or the military person could not see why it was necessary for him to change the stripes on his trousers or the piping on his coat so often, and yet if he did not change them the discoloration would reach such a stage that it would be hardly recognizable from the original stripes or piping. With the advance of science of dye manufacture, it was discovered that certain new dyes had become available for the coloring of wool, for instance, which are much faster and more satisfactory than the acid colors used heretofore, but their use and application are limited and hence their cost in some instances has proven prohibitive for ordinary purposes, and it is perhaps safe to say that if it were not for the military field, where cost does not enter into calculations, perhaps such a dyestuff, no matter how satisfactory, would never really find a market. But here the military field is a pioneer and an assistant to the industry as it is by

their use that the civilian and uniform houses become more familiar with the desirability of the so-called new inventions and after a time they come to look favorably upon a change from the old to the new, even though the cost is greater.

As a practical illustration, note these two samples of scarlet. They are used for the Artillery Branch of the service for pipings and stripes on the blue uniforms. The actual difference in cost insofar as manufacturing is concerned between the two samples is, roughly, about $2.00 per yard. It would take a good deal of convincing sales talk to sell a uniform jobber the duller sample of scarlet, and perhaps he never would succeed in convincing the jobber or tailor that this sample at $2.00 per yard would actually be a saving of many dollars to the uniform, yet by comparison the scarlet sample dyed with the acid color will fade in no time, whereas, the duller sample dyed with a comparatively new color for woolens will never change its hue and the uniform can practically be worn out without a change in the decorations. The military person immediately appreciates that the small difference of $2.00 per yard in the first cost is practically not worth speaking of when it is considered that he does not have to replace either the stripes or any portion of the decorations and does not have to buy a new piece of cloth at perhaps two-thirds greater cost, and does not have to stand the additional cost of tailoring and the inconvenience of being without his uniform while the change takes place.

For the past two years we have been investigating the fast colors on cotton cloth. Vat dyes on cotton cloth cannot be said to be a new innovation. The trade has used vat colors on cotton piece goods for perhaps a period of ten years but as you all know the degree of fastness than can be obtained by vat colors depends entirely on the combinations of colors used. The military field is not so much interested in the method of obtaining an article as it is interested in the result, that is to say, the result is of prime importance and we usually leave the method entirely to the manufacturer, but there comes a time when the method may have a decided bearing on the result of the fastness of color. A case in point is the application of vat dyes to cotton cloths and the final decision as to how it should be handled. After a period of about two years' experimentation we found that, generally speaking, the vat colors on cotton are fast provided, however, that a proper penetration has been obtained in their application.

Many attempts were made to fix the color of the olive drab cotton cloth so that it would not bleach and wash out to a dirty brown or white. Attempts in that direction ranged from making up samples of cloth by dyeing the cotton before it was spun, dyeing the yarn before the cloth was woven to mixing dyed yarns in an endeavor to obtain a resultant effect of an olive drab mixture that would be stable and would not break down in washing.

In all these attempts, while some proved slightly better than others, the general result was unsatisfactory as invariably factors were injected that made procurement of any of the cloths in such quantities as required by the Army, impracticable.

In the spring of 1928 the office of the Quartermaster General took definite steps to develop a cotton cloth that would be an improvement on the then olive drab cotton cloth and which would be generally suitable for uniforms.

As a result, a meeting of producers and finishers of cotton cloth was held. It was agreed at the meeting that the Quartermaster Corps should furnish a set of requirements in general terms covering the needs of the Army for the desired cloth and its color fastness. Accordingly, the Philadelphia Depot drew up and distributed to the cotton textile trade (through the Cotton Texile Institute) for the purpose of unifying their effort in a definite direction, the following general requirements:

1. *Cotton*—To be either combed or carded, of a grade which will meet the hereinafter described requirements.

2. *Yarn*—To be either single or 2 ply, providing it fulfills the hereinafter described requirements.

3. *Texture*—To be of such texture as to produce a clean-cut twill as shown by the enclosed sample.

4. *Weave*—3 up and 1 down twill.

5. *Weight*—Not more than 6 ounces to the linear yard of 28½ inches wide, with normal moisture content, and having proper body and handle.

6. *Width*—Can be any width, but not less than 28½ inches and not more than 57 inches.

7. *Finish*—The face to be clear, properly singed, and to conform in all respects to an acceptable material, suitable for the outer uniform of a soldier.

8. *Tensile Strength*—To be 115 in the warp and 80 in the filling.

9. *Color*—To be approximately of the same shade of color as the enclosed sample. It shall be fast under all conditions incident to military service, under the extreme rays of a tropical sun; washing under all conditions.

METHODS OF INSPECTION AND TESTS

1. *Breaking Strength*—Grab Method—the lower jaws of the machine shall travel at the uniform rate of 12 inches per minute under no load, the back jaws shall be 2 or more inches wide, and the front jaws one inch wide: the distance between the upper and lower jaws shall be 3 inches.

2. *Permanency of Color*—Boil for ten minutes in a solution of 10 grains of sodium carbonate, granular, specification No. 4-12, to one pint of water.

3. Boil for ten minutes in a solution of 80 grains of soap, laundry, specification No. 4-44, to one pint of water.

4. *Scrubbing Test*—Method as follows:

(a) Wet out the cloth thoroughly; sprinkle sodium carbonate, powdered, over the face of it and scrub up and

down from top to bottom of cloth 10 times; rinse with clear water and dry; repeat 15 times.

(b) Proceed as above and instead of sodium carbonate, use soap, laundry, specification No. 4-44, rubbing the soap over the face of the cloth until a good lather is obtained.

5. Treating by first wetting out with water, then dipping in a solution of permanganate of potash (by dissolving 1 part of permanganate of potash and 16 parts by weight of cold water) for 2 minutes, then steeping for 10 minutes in a solution of bisulphite of soda (made by dissolving 1 part of bisulphite of soda, dry, in 10 parts by weight of cold water).

6. Standing an exposure to the weather (roof test) for 30 days, or equivalent, by Fadeometer or similar means.

7. Treating by steeping in a 3° Tw. chloride of lime solution for one hour.

8. Material must not shrink more than 5 per cent in length or 2 per cent in width.

Thereafter, numerous samples embodying various types of spinning, construction and dyeing were submitted through 1928 and part of 1929 by manufacturers for test by the Philadelphia Depot in accordance with the tentative requirements.

Results of the tests on these samples indicated that the principal fault with the color was the fact that on scrubbing, the cloth invariably turned white. Careful analyses indicated that this condition was due to the fact that on scrubbing, certain fibers were raised on the cloth and the dyestuffs physically removed from the tips of these fibers, therefore giving the white appearance. In other instances, it was indicated that while the dye used withstood all the chemical tests (the assumption therefore being that the dyestuffs represented the best quality in possession of the trade), the scrubbing tests, however, showed that the method of application of three fast dyestuffs was faulty.

The problem then became, how to overcome the mechanical breaking down of the color. A study indicated that the solution to the problem was to devise a method of not permitting as many cotton fibers to come through the cloth itself as was previously possible.

Early in 1929, it had become evident to the Philadelphia Depot that while considerable strides had been made in obtaining a degree of color fastness on the dyeing of cotton cloth, the principal fault appeared to be mechanical. During the many conferences held between the representatives of the Philadelphia Depot and the trade it was apparent that there was a general disinclination of the cotton trade to venture into what may be said to be a "NEW FIELD," that is, they all agreed that the fault of lack of color fastness was due to mechanical rather than chemical action but they could not agree to the manner in which it could be overcome. The Philadelphia Depot suggested that a method be devised wherein the cotton fibers in each thread would be so twisted and finally placed in the cloth that it would be more difficult, in scrubbing, for individual fibers to come to the surface. After several unsuccessful attempts to have the trade experiment along this direction, the Philadelphia Depot prepared a specification which calculated in the main to cover this requirement and it was done as follows:

1st—The specification prescribed that all the yarns were to be combed for the reason that when fibers are combed the structure of the yarn itself is such that each fiber then lies perfectly parallel to its neighbor.

2nd—It was provided in making the thread or yarn that it should be double or two-ply instead of single. This was done to again provide a medium of more closely burying the tips of the fibers in the yarn itself.

3rd—The direction of the twill line in the cloth was required to be to the right. This was done to further conceal the tips of the fiber within the cloth itself and this was determined by the direction of the various twists given the thread in the process of manufacture.

To afford better penetration of the dyestuffs, the specification provided that the cloth before dyeing be made perfectly absorbent and that was to be done by having the cloth fully mercerized and bleached. The truth of that can be tested by almost anyone familiar with cotton. If a small quantity of unprocessed cotton is immersed in water, it will be found that the cotton will not absorb the water but it will float on the surface. This is due to the natural waxes of the cotton insulating the fibers, thus preventing the cotton from absorbing water, but if the cotton is mercerized or bleached then it becomes absorbent and when immersed in water it will immediately sink to the bottom of the vessel. It was this principle that was embodied in the specification to provide for a greater dye absorbency in the khaki uniform cloth.

For the purpose of testing the specification, the Quartermaster General approved the recommendation of the Philadelphia Depot to make an initial purchase of 10,000 yards. Accordingly invitations for bids were mailed to the trade April 12, 1929, thus broadcasting to the cotton textile trade the specification in the form of an advertisement for a quantity of the cloth and at the same time testing its practicability before purchasing large quantities.

It is interesting to note that after the invitation had been out in the trade for about ten days, personal and written protests were received by the Quartermaster General's Office and the Philadelphia Depot stating in effect that the specifications were entirely theoretical, extremely impracticable and even alluded to the idea that they were prepared by someone not familiar with the trade and stating in fact that it would be impracticable to produce the tensile strength called for on a cloth as light as 6-ounces per linear yard of 28-inch width. So vigorously did the protests continue that the Quartermaster General deemed it advisable to have the Philadelphia Depot test the specification it had prepared by having a sample piece of cloth produced under its direction.

The feat of producing the sample is rather interesting. The trade as a whole maintained that the cloth could not

be produced. The Philadelphia Depot has no spinning, weaving, dyeing or finishing facilities for the production of samples, yet the production of a sample within the shortest possible time was of the utmost importance as the Philadelphia Depot had a large accumulation of orders for cotton uniforms which could not be filled until a satisfactory cloth was produced.

Bids on the 10,000 yards of experimental cloth were to be opened on May 13, 1929, but in view of the contentions of the trade, the Philadelphia Depot recommended to the Quartermaster General that it be permitted to postpone the opening for one month, maintaining that in that time it would actually bring about the production of the sample and present it to the trade and the Quartermaster General and disprove the claim that the cloth could not be produced.

Before the end of May the much disputed sample was actually produced, presented to the Quartermaster General and the trade and thus the contentions of some of the cotton cloth producers were disproved and the production of the cloth became an accomplished fact.

It is interesting to note that whereas the disputed specification called for a tensile strength of only 125 lbs. in the warp by 90 lbs. in the filling, the sample produced by the Depot did not vary in weight as much as 1/10-ounce from the original 6-ounces set by the specification and had a tensile strength of 185 lbs. in the warp by 112 lbs. in the filling.

There was a further contention as to price, some maintaining that the price would run as high as 60 cents or more, while the figures compiled by the Philadelphia Depot indicated that in no instances should the price be more than 48 cents per square yard. The postponed bids for the 10,000 yards were opened June 13, 1929, but they were all rejected for the reason that it was no longer necessary to make an experimental sample as the Quartermaster Corps had otherwise brought about its production; therefore, the 10,000 yards were no longer required.

One thing, however, this bid opening proved—the prices were within reasonable limits; in other words, the average price bid was around 45 cents per square yard and purchases made since were about 42 to 43 cents per square yard.

The foregoing indicates the difficulties manufacturers as well as military are having in their effort to obtain uniformity of color but the military is not unmindful of the manufacturers' problems, and they in turn are always studying the problem with a view of utilizing, if possible, means of alleviating this condition and at the same time giving them colors of as nearly a uniform character as it is possible to obtain.

It is believed that in so far as the eye is concerned, it is possible to overcome small differences in color by actually making greater differences in the general landscape view. You will all recall the camouflage proposition that was tried out and used during the World War. The proposition then was in order to make an object indistinguishable it was painted with many colors and an attempt was made to blend in the object with its background.

In the instance of the uniforms, after an agitation of several years, the War Department has recently approved the proposition of giving the soldier a uniform of two distinct shades, the breeches of one shade and the coat of another, which in this instance is darker than that of the breeches.

While this principle has been tried out before, but perhaps not for the purpose of uniformity of shade but rather as a general uniform color scheme, this is the first time that we have accepted this principle for our soldiers and it is the idea that the small differences in the shade between the coats themselves and the breeches themselves should become indistinguishable by the reason of the greater difference en masse of the general view of troops with one color coat and another color breeches.

MARCH MEETING OF NEW YORK SECTION

THE New York Section of the American Association of Textile Chemists convened Friday, March 27, 1931, at 8:15 p. m., at the Alexander Hotel, Paterson, New Jersey, Mr. Robert H. Gaede, Chairman of the Section, presiding.

Following routine business of the Section, Chairman Gaede introduced the speaker of the evening as follows:

Chairman Gaede: We have as speaker tonight a gentleman who has been at many of our meetings, a gentleman whom most of us know for a long time. He will speak to us on "Recent Developments in Printing Thickeners."

I would like to introduce Mr. Thomas R. Harris, of Herrick & Voigt Chemical Corporation. (Applause.)

Mr. Harris presented his prepared paper. (Applause).

Recent Developments in Printing Thickeners

By THOMAS R. HARRIS
Herrick & Voigt Chem. Corp.

A LITTLE over two years ago I had the honor to deliver a paper before this section covering the various gums used in textile printing. At that time I endeavored to cover as fully as possible the various kinds of natural gums and gum substitutes available to the colorist.

The Chairman of the Speakers' Committee has asked me tonight to tell what changes have taken place since then. This I was reluctant to do as I felt that there were many other members of our Association who are better qualified to talk on the subject. Still, as he was insistant,

I have prepared this paper which I hope will give as concisely as possible the improvements and changes.

If I have failed to mention any new gums, or refinements in old gums, I trust that you will consider that it is because the matter has not come to my attention and not that I have not tried to cover the field fully and impartially, telling you what I know, or have been told, of the merits of the respective materials and still keeping this paper purely along scientific lines and not a selling talk for any particular product or products.

Probably you all are interested chiefly in gums for silk printing, either blotch or discharge, and vat color work on rayon and silk. Accordingly, I will first take up the silk printing gums.

Two years ago most of the patterns that were being printed were large objects, produced on very heavily weighted silk. Weighting of 40 per cent to 50 per cent and even more, was the rule. Penetration was difficult to secure and sharpness of outline not essential as, in a majority of the patterns, the colors merged one into the other. The result was that colorists asked for a gum which would give a print as soft as possible, and sharpness of line was sacrificed to penetration and easier washing.

The makers of prepared gums all sought to make a product to meet these requirements. As a result, gums of apparent strength (and I say *apparent* advisedly, and later on will cover this more fully) were produced and used. They met the conditions and good results were secured.

Then the style changed. Fine lines became the vogue. Colorists and printers clamored for thicker and thicker gums. But it was not thicker gum they wanted, that is, thicker in looks or feel, or viscosity test. What was needed was gum with more "guts," a gum which would stand the churning received in the color boxes and not thin down on running. A gum with body enough to give fine lines, but still fluid enough to flow freely. A gum heavy enough to print well and soluble enough to wash easily.

The result is the present gums. By viscosity test they are thinner, but a print color made with them has more body. In flow there is no comparison. Perhaps I can show this better by demonstration.

This is a gum which was used a little over a year ago, and this one a present-day gum. Note the difference in time required in test tube No. 1 and No. 2 to complete their flow. The viscosity of No. 1 is higher, but the working qualities poorer, in that it has "apparent" body, but no real density.

To meet these new requirements the gum manufacturers are now delivering gums with the necessary flow and body. This took a little time as it required changes in the manufacturing process.

You will ask what bearing the water taking quality of a gum has on the suitability of such a gum for printing. The first and most obvious answer is that, in the case of a gum that takes water readily, it is easier to incorporate the dissolved dyestuff and necessary additions to make a print color of the desired thickness. This is especially important in the cases of such colors as are hard to incorporate thoroughly in the thickener.

The second reason (and one which I have never heard expressed before in regard to a thickening agent, but which was touched upon by Dr. Pierce in his talk at the February meeting when discussing a dyestuff), has, I feel, more bearing than the previous answer. The dyestuff used in printing is dissolved and incorporated in the gum. The desired impression is made at the time of the contact of the cloth with the engraved roller. The dyestuff has now been placed upon the cloth in the desired pattern, but the real dyeing, or impregnation of the dyestuff on the fiber, has not yet taken place. It is now necessary to either steam the goods, or pass them through an ager, to fix the color on the cloth.

It is in the steaming, or aging, process that the gum, containing the color, releases the dye so that it exhausts upon the cloth, producing the desired shade. It is proper to regard this stage of the process as if you were dyeing the printed area; just as though this part of the pattern were cut from the cloth and put into a dyebath. The dye, at the start, would begin to go slowly on to the fiber, and the operation would continue until the dye had exhausted to such a point that the desired shade was obtained. In the steaming and aging operations, instead of a bath charged with dye, and brought up to the requisite temperature, we have a gum carrying agent charged with the dyestuff, and in place of the water we have the moist steam, which contains moisture. This steam softens the dry film of gum and causes the dye to penetrate and fix upon the cloth.

With this picture in mind you can see that a gum that takes water readily in the first place, will take water readily when dry.

The third answer is obvious in that when you are through with the actual printing, steaming and aging operations, you desire to wash out any gum that is left in the cloth. Therefore, the more water soluble the gum, the better its washing qualities.

Today there are available on the market silk gums which have been processed in such a way that when making up a hydrosulphite gum there will be no blackening, even though such a gum is kept for a period of a week, or longer, before using.

The main improvements made in silk printing gums are, as I have attempted to explain above, their "better flow" and "water taking qualities," and also their present greater transparency secured by the more thorough elimination of impurities, such as fine pieces of bark and minute particles of unconverted gum. I can illustrate this

best by referring you to test tube No. 2 as against No. 1 and should anybody care to do so, later on you can examine some of these gums under a strong magnifying glass. This is merely a refinement in the process, which is being done today by several of the manufacturers of gums, and shows that they are all striving to give to the colorist a product containing as nearly as possible a gum free from all foreign ingredients.

You have all experienced difficulty at times in making colors that are speck free. The dyestuff, when dissolved with water and possibly the addition of a solvent, is apparently well dispersed, but upon incorporating the color in the gum, you get specks. Sometimes this will not occur for months. Then, for a time, it is impossible to make a color that is not full of specks. Of course, the first things blamed are the gum and the dyestuff. It might be either one. However, I know of colorists who, when they make up a color they know is apt to be troublesome, always put it through a colloid mill and they tell me that they then experience no difficulty from specks. The answer to this is, I believe, that there are certain colors that are extremely difficult to incorporate, even with careful stirring, but any minute particles of dye which cannot be incorporated by stirring are brought into a homogeneous mass by the colloid mill. This is particularly true in regard to certain Navies, Blacks and Browns.

There is hardly a silk printing shop today that does not also print rayon, and this means fast colors. There is also a certain amount of this class of work being done in silk. Therefore, the undertanding of the best materials to use for an alkaline thickener, and their proper preparation, are of utmost importance at this time.

In cotton printing with vat colors, the main idea was to put the color on the face of the goods, with very little attention given to penetration. The best value had to be secured from the vat colors used, as the price paid for this work was low and a difference in cost of even 1/16c per yard important. Therefore, most of the cotton vat color printing is done with British gum and starch in proportions of about one to one, using roughly 1 to 2 pounds to the gallon of boiled up thickener. Not much attention is paid to sharp lines, or to penetration. Flow, mark and penetration are sacrificed to increased color value.

In printing rayon crepes and other high-grade fabrics, the converter, and the ultimate consumer, have demanded the same patterns as are used on silk, with their fine lines and bright colors, and they will not accept work where the color is only on the face but demand, as nearly as possible, the same penetration as they secure on silk. This has meant that the colorist must have, in his alkaline thickener, a gum which closely approximates, in flow and penetrating qualities, the gum he uses for silk printing. He cannot, in most cases, use a starch-British gum mixture.

At the start, color value could be more or less ignored, as high prices were paid for this work, but with the competition today color value is of more and more importance. The securing of 5 or 10 or 20 per cent more value from a vat dyestuff, when you run into production of a million or more yards per month, means a lot of money.

To meet this the manufacturer of converted starches—call them British gums, or dextrines, or what you will—have sought to furnish products giving the maximum color value and the best flow possible. They have aimed to secure products which do not jell.

It is not necessary to tell you gentlemen that the freer flowing the gum you use, the better the penetration on hard twisted fabrics and the better the mark, with less "sticking in" in the engraving or "drying in" in the ultimate print. Furthermore, this requirement has brought into quite general use the additions of natural gums to the alkaline thickener to aid in penetration and sharpness of mark. Most of the prepared silk printing gums sold today will stand Carbonate of Potash up to 15 per cent, and there are plants that use such gums alone, where they feel that they can afford the cost, although the general practice is to use only from 5 to 35 per cent of such gum, figured on finished color.

You may ask what are the general characteristics of these recent British gums? There are several on the market and in most cases instead of using from 2½ to 4 pounds to the gallon, a thickener of suitable strength is secured with anywheres from 1¼ to 2 pounds to the gallon. This means less dry material in the print color and it is a safe, general rule to assume, that the less dry matter, the better the penetration. Furthermore, they have been converted with especial attention to withstanding Carbonate of Potash without jelling.

Most plants make their own alkaline thickener, as where the necessary equipment is available, this can be done more economically than purchasing a boiled up product. The proper preparation of the thickener is very important. To begin with, it is necessary to have a copper jacketed kettle equipped with planetary stirrers. The dry gum should first be well wet out in cold water, and then the steam turned on. The material should be thoroughly cooked, the length of time varying with the gum used and the steam pressure available. Some colorists prefer to incorporate their potash before boiling, as they feel that the action of the potash more thoroughly converts the thickener. This possibly is true where starch is used. However, when the potash is boiled in the gum, or added while the gum is still hot, that is, any temperature in excess of 120° F., you secure a much darker colored paste than when the potash is added during the cooling down process. I cannot stress too much the necessity of slowly cooling down on alkaline thickener with constant agitation, as this will result in a smooth, good running paste, whereas without proper agitation you are liable to get a granular product.

There is a considerable amount of screen printing being done with vat colors. Where bright shades are desired, and penertation is not so important, as in the case of dress goods, or material designed for pajamas or kimonas, special British gums can be used satisfactorily, either alone or in conjunction with the prepared printing gums. For better penetration on work such as scarfs and mufflers, either the prepared printing gums or tragacanth, give the best results. In the latter case, as a rule, prepared standards are not used, but the printing is done immediately upon the preparation of the colors.

Most of the improvements in the gums have been the result of suggestions from colorists and printers. I feel that you men can assist materially in further development work if you will carry on in your respective plants real comparative trials of various products under conditions which are fair, that is, when comparing one gum with another, take a design of four or five colors with engraving that is practically similar in depth and lines. Use in a practical run, gums which you are comparing for relative money value of thickener or dyestuff. Compare the printing qualities of the different gums, the brightness of the colors, and the softness of the washed print. Show these results to your respective suppliers of materials and suggest to them any improvements which you feel can be made. I know that all those serving the textile printing trade are only too anxious to help the colorist and the printer, and that they will be only too glad to co-operate in every way. Help them by practical demonstrations and they will help you by giving you better products to use.

If there are any questions that you may care to ask, I am sure that, if I have not the information, there are many colorists and printers here who will be able to answer your questions, basing their replies on their personal experience with the particular problem.

I thank you.

Chairman Gaede: Are there any questions that anyone would like to ask Mr. Harris?

Mr. DuBois: Is it possible for gum to ferment on standing and go on the acid side, causing colors to precipitate?

Mr. Harris: Well, gum will ferment if you do not put in a preservative, because gum is a natural vegetable product. If you put into the gum a proper preservative the gum will not ferment.

Mr. DuBois: Another question. On adding potash, you very often get a chemical action on the copper. This may seem like a foolish question to you but still it is a very important one. I am always a little afraid of potash, for that reason.

Mr. Harris: Well, carbonate of potash is used in about ninety-eight per cent of the vat color printing that is done. There are a few plants down East that use soda ash instead of potash and there is one plant that uses caustic with some colors.

Chairman Gaede: Are there any further questions?

Mr. Philip H. Stott: Mr. Chairman, I would like to ask Mr. Harris a question. It is more or less of an academic one, I must confess, and that is, has Mr. Harris ever experienced or ever caused a study to be made of the effect of adding one colloid to another, as regards the specking of vat prints?

To extemporize a little on that, a vat color paste—of course they are made in America today—is almost a perfect colloid. It is safe to assume that the potash paste properly prepared is also almost a perfect colloid. In case the vat color paste, let us say, is thinner or thicker than the corresponding colloid of the printing paste, have you ever ascribed a specking, so-called specking, of vat color prints to a breaking down of the one colloid, either the printing paste or the vat color paste, by incorporation of two colloids of different consistency one with the other? Do you know of anything that has ever been done along those lines?

Mr. Harris: No, I don't. I know that a good many plants are using colloid mills, putting their vat colors through a colloid mill, but they have found that some vat colors are thrown out when they put them through.

Mr. Stott: That would be apparent of course in the original vat color paste.

Mr. Harris: That is, before going through the machine. They don't put those colors through. They find it is not satisfactory to put those colors through.

Mr. Stott: Of course, the vat color pastes themselves from the standpoint of the manufacturer are I believe in most cases put through a colloid mill before they get to the print shop.

Mr. Harris: I am talking about when they get them into the print paste—

Mr. Stott: They even go to the trouble of putting the printing paste—

Mr. Harris: They make up the vat color—the finished vat color paste before going to the printing machine is put through a colloid mill.

Mr. Stott: Is that so?

Mr. Harris: Yes, because they find they get a better incorporated color.

Mr. Stott: Just as a matter of opinion, you don't necessarily have to go on record, but do you think that there is a possibility of there being anything to that theory of a physical reaction between one colloid and another—I don't know enough about colloid chemistry to express an opinion—where one colloid would tend to break down another and thereby cause specks? Or is there any gentleman in the audience who has given consideration to that? It is an interesting point.

Mr. Harris: I couldn't answer that question, myself.

Chairman Gaede: Is there anyone here who can answer that question for Mr. Stott?

Mr. William Seltzer: I don't know that I can answer the question very specifically but I do know that in colloid chemistry it is known that certain colloids are antagonistic to others, and that the mixture of two antagonistic colloids will cause precipitation. I think the customary explanation is that the two antagonistic colloids carry different electric charges.

That may not answer the question specifically but I think it bears on the theory.

Mr. Stott: I think it does support the theory and of course it is always logical to assume under circumstances of that kind, that what might happen one day would not necessarily happen the next day, if the conditions were different, by reason of lack of mechanical care, or mechanical conditions in mixing the two pastes. I should think so at all events. Would you think that also, Mr. Seltzer?

Mr. Seltzer: I think from what little I know about that particular subject that it wouldn't make very much difference what mechanical processing you gave that mixture. I think it bears more on the original electrical charge carried by the colloid, and it doesn't make any difference how well or how poorly they were mixed together. I don't think that even a colloid mill would overcome that difficulty.

Mr. Moore: I believe it is the dyestuff and not the colloid that causes the precipitation. Why is it that some dyestuffs will precipitate and other dyestuffs will carry on and form a smooth paste, even when the same thickener is used? Is it possible it is in the dyestuff and not the colloid?

Chairman Gaede: Will you answer that, Mr. Stott?

Mr. Stott: I think probably that question has been answered by Mr. Seltzer to a certain extent, inasmuch as he seems to think that what you would call the electrical coefficient of the two colloids, proving antagonistic, would cause precipitation in some cases and not in others. I believe it is a well-known fact that certain dyestuffs which we will assume for the time being are not colloids, if they are treated physically, either by suitable dilution or a suitable concentration, and then added to the same thickening paste, will not speck. Now, if they were not colloids to begin with, as the last speaker intimated, certainly just the addition of water or the evaporation of water is not going to convert them into colloids, but it does overcome the specking, and of course specking is caused by precipitation.

Chairman Gaede: Are there any other questions in regard to the application of thickeners or any other questions you want to ask Mr. Harris? I am sure Mr. Harris brought out a good many points that might warrant discussion.

Mr. Wood, have you anything to discuss on the matter?

President Wood: No, I don't know that I have. There are lots of mysteries that come up in the printing business that we blame the gum for. I suppose Mr. Harris knows as much about them as I do. He has been on the receiving end of the complaints.

I remember the first time I came in contact with difficulties in the printing business with regard to the dissolving of Induline, some types of Induline, in making a printing mixture. We found that Induline in combination with certain dyestuffs worked perfectly well and in combination with other dyestuffs didn't work at all. I think our old friend Rudolph here knows all about that.

I remember one of his dyestuffs caused us a lot of trouble at that time. We had difficulty with one particular color at that time. This was a blue that was supposed to be a particularly good color. We overcame the difficulty however and it gave us the result we wanted.

The peculiar part of some of those things is that if you mix two dyestuffs together (even though they react separately), when they are mixed together they give a perfect result, and that is something I have never been able to understand.

I think another fertile field for research would be the action of various dyestuffs on gums, especially on the working conditions, with regard to the thickening up of the gums, or the bad habits of the gums under certain conditions. I don't think quite enough work has been done there.

It occurs to me that it might be a very interesting thing to look into the effect of various dyestuffs on the gum after running in the machine with regard to their viscosity, for one thing, and with regard to the amount of foaming that they exhibit.

I think all of those around the table engaged in the printing industry will remember one or two colors which always caused them trouble in foaming. I know one is Primuline Yellow. That has two bad habits. As far as our experience goes, no matter what thickener you use with it, it seems to streak very badly in certain concentrations. It nearly always foams badly, and it seems to deposit a sort of curve on the doctor, and that probably causes the streaking. At times I have seen it take the face of the doctor right off and make a lot of very bad streaks, and you could clean up every five minutes and start over again and strain the color and you would get the same thing within a very few rounds of the rollers.

That only happens in very, very strong concentrations with that color, which is a color of weak tinctorial power, and it means you have to run it into high strength before you get a satisfactory heavy color.

There again you don't find the same thing when you mix it with other colors.

There are a lot of things that have to be explained, I

think, and it would be very interesting if some of these expert colloid chemists (they didn't know anything about colloid chemistry when I went to college), some of these men who know all about electric charges and these things would look into them. They would probably find out something interesting and at least be able to explain these things even if they can't cure them, and that is some consolation at times.

Mr. Stewart F. Carter: It has just occurred to me, thinking over the matter of specking, that some time back some cases of that come under my notice that were cured by pre-reduction, that is, the addition of some ordinary hydrosulphite to the print color. There were some very obstinate cases of that, and that seemed to check it altogether. I think perhaps Mr. Stott can verify that. Isn't that a fact, Mr. Stott?

Mr. Stott: I presume it is. Of course, the addition of hydrosulphite, at least, the ordinary dyeing hydrosulphite (which is what you refer to I suppose) necessarily has the effect of solubilizing the dyestuff and of course if there are any minute particles of dyestuff which are, let us say, broken down by the mixing of the two colors it will certainly have the effect of putting them into solution, thereby eliminating the specks. So I presume that is perfectly reasonable.

Of course, I think (it has been my experience at all events) that most printers rather object to using the necessary amount of caustic soda which should go with the hydrosulphite on account of the difficulty of handling, and it certainly has a tendency to make the paste somewhat more unstable on long standing. But I should think that it would tend to eliminate the specks to a certain extent.

Mr. Stewart F. Carter: That was the only thing we did. Whenever we found a bad case we thought that that was the reasonable thing to do.

Chairman Gaede: Mr. Carter has answered one of the questions which Mr. Wood brought up. Can anyone answer any of his other questions?

Mr. Stott: I don't want to monopolize the floor unnecessarily but there is one other thing that I would like to bring up here and perhaps we can start a little discussion on the subject. It reverts back to the old trouble of specking.

Has it been the experience of you practical printers that when a certain mixture of printing paste containing the color has a tendency to speck, anyway, it seems to speck more under severe conditions of steaming that it does when the steaming is light? I mean, suppose you ran it through your ager for two and a half minutes, let us say. You would get no specks, although of course you do not develop the full tinctorial value of the print. On the other hand if you run it through your ager for six or seven minutes you do develop the print but it is in the form of specks.

Has that been the experience of any of you, and if so, is there any explanation for it? That is just to start a discussion?

Chairman Gaede: Can you answer that, Mr. Harris?

Mr. Harris: No, I can't.

Chairman Gaede: I know nothing at all about printing. Therefore I cannot help at all in connection with that question. Are there any printers who will volunteer an answer to that?

Mr. Stott: Apparently it hasn't been the experience of any of these gentlemen.

Chairman Gaede: All right, that question doesn't seem to get any answer. Is there any question that anyone else would like to bring up?

Mr. W. B. Carter: Mr. Chairman, speaking about these gums, I am not a printer at all, but I am rather interested in one thing. Mr. Harris said that the newer gum, apparently, in his tubes there has about fifty per cent of the viscosity of the older gum, and yet he says it has more body. What property is that? Is it a property of density or surface tension?

Mr. Harris: I would say it was a property of density. There is more density, whereas, as I tried to explain previously when they went into more of the weighted goods with the patterns that didn't fit in so close (there were more big objects), to get penetration they went more and more to a gum with less density of body. The gum didn't have as much flow. It was not as fluid.

Most of the gums today (even the heavier gums) have a long, continuous flow, whereas the other gums had a much shorter flow. Now they have a real body—you might say tragacanth is thick, but it hasn't any real body. Most of the silk printing gums today have real body as compared to apparent body, and I illustrate "trag" as having apparent body without real body. In other words, there is really more body there to carry the dyestuff in a more fluid form than there used to be.

They get that, as I understand, by a more refined cooking, to get a better colloid, to make a more true colloid out of the gum than they were previously getting.

Does that answer the question?

Mr. Carter: I think so, because that same question used to come up. We were making paint down at Philadelphia at one time and the question of body always used to come up there, and the paint people would come along and say that one paint had much more body than another. Yet nobody seemed to be able to explain very well what was meant by "body." You could look at it, and you could spot it very easily, but it seemed to be elusive as far as actual measurement was concerned.

Mr. Green: Mr. Chairman, I used to be connected with the New Jersey Zinc Company and they were interested in making pigments for the paint people. We went into this question of body quite fully and I believe we worked out a picture of it, and this picture has been more or less accepted during the last ten years.

Paint is not a viscous liquid. I am not a printer. I don't know just how much this applies to any of your work at all. Paint is a placid material and it has two factors: one, mobility; and the other, what we call "yield value." And the yield value is the thing that gives the so-called body to the paint, and I imagine it is the same thing you are talking about here tonight. The yield value is due to the fact that paint is a two-phase material, that is, a liquid and a solid, and when a solid particle meets the liquid particle, the pigment particle, it flocculates and forms a structure in the paint, a loose structure, to be true, and that gives the plastic nature to the paint, or the body. When we put in a wetter, like a heavy body oil, it deflocculates the paint particle and the plasticity is gone and the body is also gone.

Chairman Gaede: Does that answer your question thoroughly?

Mr. W. B. Carter: That sounds reasonable. As I said before, I am not a printer and I am not particularly familiar with that, but I did run into that same problem before in the paint industry, and I think it would be somewhat of the same proposition.

Mr. Green: By "body" do you mean the fact that the material doesn't flow, that it is very soft, you can build it up?

Mr. Carter: Yes.

Mr. Green: That is the same thing the paint man has, and that is really the flocculated particles of the paint.

Mr. John J. Sokolinski: Wouldn't that be the same as if you took cornstarch, raw cornstarch, which you can boil up, we will say, one to eight, and you will get a very gelatinous mass? Take that same cornstarch and convert it so that you have sugar syrup or glucose and you will have fluidity; that is, you will have it very compact, yet you will have more weight, and you will have far more spread with that same material converted, although you will not have the body. That is, you will have compactness, where you have that same amount of starch cooked up, like a sponge. I mean, it is gelatinous, and if you spread it out it breaks short; it has a lot of water in it. Still, if you break that down to glucose and spread it out, you have a nice even heavy spread.

Does that explain it more fully? I mean, it would be the same as if you took cornstarch and cooked it up, as one example, and then took starch and converted it into dextrine. If you take that one to eight cornstarch (that is, one part of starch and eight parts of water) and convert that starch into dextrine and make a fifty per cent solution, you will have it compact, it won't be so spongy, and you will have far more covering surface, although you really sacrifice viscosity for fluidity. That is, it can be fluid until you come to a certain strength. Then you would come down to your viscosity again. And if you can build that up, add alkalies then, just simply puff it up, it isn't that you add compactness, you just simply swell it up.

I don't know whether that answers it or not. That is just a general explanation.

Mr. Carter: I think that would be another case of it, all right.

Mr. Sokolinski: Very often in sizing, they will take, for instance, some of these gums; they can get a five per cent solution and it looks heavy. They imagine they have a nice product, and they can pretty nearly walk on it. Yet, they try to size with that and it has no spread. It is pretty nearly all water. They can cook that up with starch, and might as well leave some of it out, because it has no covering surface at all. Try to size with that alone, and they have that amount of water that has to be evaporated. Yet, compact that and they have something that has cover to it.

Chairman Gaede: Are there any further questions?

Mr. Green: I think the similarity between paint and the problem here is very apparent. The only difference is you people are working with true colloids, that is, some microscopic particles, while the paint men work with particles that are very nearly colloids—they are around three-tenths of a micron, instead of one-tenth.

When the paint man gets a flocculated paint that won't flow, that is, one of high body, he can work that by putting in what we call a wetter. That is probably a fatty acid. And the body is immediately broken down and the paint deflocculates and you get tremendous body.

I don't know whether that would apply to this specky business or not, but if specking is due to flocculation it seems to me with very minute traces of the right material you can disperse that, the same as the paint man disperses a highly flocculated paint.

Unfortunately, I didn't hear the paper (I came in too late) and I am talking about something I don't know anything about.

Chairman Gaede: I think you have explained some of the things, Mr. Green, and brought out certain questions, at least as to the similarity between colloids, which we are speaking about, and paint.

Has anyone had any experience with the things Mr. Green mentions?

Mr. Booth: Mr. Chairman, I would like to ask our speaker what test if any is being used to measure these gums. My thought is that perhaps it may be something in line with surface tension. If so, it would seem as though surface tension rather than viscosity might give a better value to the gum.

Mr. Harris: I believe the test that is generally used is more a viscosity test, although as I tried to bring out tonight I don't think viscosity alone answers the question. In other words, if you take a measured amount of gum, say, twenty c.c.'s of gum, and you dilute that gum down, that is, have a diluted gum, we will say, one of gum, and one of water or one of gum and two of

water, and if you take the number of seconds of flow, it doesn't tell you the real body of that gum, when you come to print with it. I have seen a gum that was very heavy under that test and yet when you got it in the printing machine and you had a color made up of it, it didn't have real body. You might send it to the printing machine strong and you would run it for fifteen or twenty minutes, or a half hour, and it would thin down. I think, really, practically all the gums that I have seen, prepared gums, have gone more to density, to get real body in there, rather than apparent strength. That is why I feel that, although viscosity is important, and the gum makers have to use some method to deliver a product that is more or less uniform, and the viscosity test is about as quick a method as they can get to check, it doesn't tell the whole story. I think really the body in the material, after it is made up into the color, answers it much more than viscosity. And that is one reason why I stressed the importance of real practical trials in actual printing. I felt that if the different colorists and printers would make more trials, and really show the dextrine manufacturers and the gum manufacturers, they would get a lot further than they would by just talking about it.

Mr. Green: Mr. Chairman, I apologize for taking up so much time but the surface tension idea brought up by the gentleman down there is a very important one and is really the basis of the whole subject of body. It is not viscosity, nor is it surface tension of the liquid itself, but interfacial tension between the liquid and the particles. When that interfacial tension is high, equilibrium does not set in until the particles flocculate, and that is based on a very well-known principle in physics.

Surface tension does play a very great part in the whole thing.

Chairman Gaede: Thank you, Mr. Green. Does that answer your question, Mr. Booth?

Mr. Booth: Yes, that is very interesting, Mr. Chairman. I bring that up from a slight knowledge of the petroleum game, and I see a close similarity there. They have come to the conclusion that viscosity is not the important thing at all, although they use as we do with our testing of gums, the viscosity test. But they rely more on surface tension now than anything else.

They find that the viscosity, as the gentleman at the other end of the table stated, is a rough guide. It is not by any means an accurate way to judge the sticking power of the substance. By "sticking power," I mean "body," or whatever term you wish to use for it.

I think we have a similar thing here where the gum must cling to the roller, and the same way in a machine, the oil must cling to the metallic parts, and to do that, it must have something in it to enable it to grip. Something must increase the surface tension there. It seems to me the problem is quite similar.

Mr. Seltzer: Mr. Chairman, may I suggest, to express it just a bit crudely, that the problem of printing gums, securing the desired body of a good printing gum, hinges more on whether or not the gum particles used to prepare that printing gum are swollen, or whether they are really in solution?

You might take gum tragacanth or other gums which swell in water. A paste made of gum tragacanth measured by the ordinary viscosimeter would show high viscosity. Yet the actual solid content might be very low. On the other hand you might take a gum such as Mr. Harris described as being more or less the ideal, or a better printing gum. Its viscosity might, measured by the viscosimeter, be a whole lot less than a dilute swollen gum tragacanth solution. The particles of the gum being really in solution, rather than in a swollen state, a paste prepared by a solution of the dissolved gum particles would show lower viscosity than the gum tragacanth, yet the one of lower viscosity would be a whole lot better in practice as a printing gum than the swollen gum.

Mr. Stewart F. Carter: I think we get an example of the matter that Mr. Seltzer has spoken of sometimes with arabic or Senegal, where you will make a solution of two gums and one, a person would say, was thicker. It is not really thickness. It is due to the fact that those gums contain at times different quantities of the substance tosulinth which is something like basorin. So you might have one of those gums which, if you tested the viscosity, would show high but at the same time it wouldn't be as effective a gum as the one that might show less viscosity, due to the absence of that body. They find that very often. We used to find that very often in printing, in block printing, in what we called "Tobey" work, where the color was sprung through a sieve. It had to come up through the sieve to meet the block and some gums had to be thrown out altogether because they wouldn't boil. They had pastiness in them.

There is another question that comes to my mind that I would like to ask Mr. Harris, and that is with regard to the textile gums (the prepared gums), the difference you will find among some individual gums in the way they harden with a chrome color, where you have chrome acetate present. Some of them will not harden as much as others.

Some little time back I had occasion to look into the matter of the action of textile gums with steam black. Everybody in the printing business knows how a textile gum with steam black sets hard. I took one gum and tried the mixture with a number of these blacks made according to different standard formulae, and some of them I found set a great deal harder than others. The printing color was put by and observed from day to day. Some of them gelatinized very quickly and others took quite some time, a few days, to get in such a state that they wouldn't give a mark in printing.

The reasons for that, and comparing the difference in the preparation of those steam blacks, is something I have not quite gotten all my data together on. I hope some time before long I will. But there was a very marked difference.

Then, as I say, some of the other gums that were printed with ordinary chrome colors we found were a great deal stiffer and more obstinate to wash out than others.

Have you had any experience with that point?

Mr. Harris: Do you mean in the action of acetate of chrome on gums?

Mr. Carter: Yes.

Mr. Harris: I have. In fact, I have done a lot of work on that.

We have found, just as you say, that out of twenty or thirty different lots of gums one will act a whole lot better with acetate of chrome than the others. We have found that some lots of gum we get in work a whole lot better with it. There really hasn't been enough research work done on that subject, because today there isn't very much acetate of chrome used in silk printing. But I have seen that difference. I have at times seen gums that would stand acetate of chrome perfectly, while others would be thrown absolutely out. In twenty-four hours you could throw the color across the room.

Mr. Carter: One thing that may help you is the addition of borax. Have you ever noticed how some gums behave when you add borax to them? That will give you a bit of a lead perhaps on that.

Mr. Harris: As I said before, when it comes to acetate of chrome in silk printing, although a good deal was used in the past, it isn't used to quite that extent today. Of course, they use it on silk and cotton, and cotton. Generally they use a Butul Gum Jug thickener.

Mr. Hilton: I don't agree with Mr. Harris on that. For over twenty years I have used mixtures of gum tragacanth and it is years and years since I had to drop out tragacanth with acetate of chrome. Acetate of chrome every time will gelatinize and make it go almost like leather. Try tragacanth and acetate of chrome in a test tube, put it over a burner, and you will find it will get leathery.

Chairman Gaede: Are there any further questions?

Mr. Seltzer: Mr. Harris stresses the point of the difference in density or fluidity of these printing pastes. I wonder if there is any relation between this condition and the actual dry solids in your pastes. What I mean by that is, Has the denser paste more dry solids than the other, or is this merely a natural characteristic of your gum, to produce this difference in fluidity?

Mr. Harris: In some cases they will have more dry solids but that again depends on the degree, as was brought out here. I believe it is more a matter of actually making a real dissolved gum there rather than more or less just a swelling-up gum. I have seen some with a very high solid which wouldn't have as much body as a gum with less solid.

So that doesn't always answer the question.

When you get into the question of gums, you are getting into something on which there is absolutely no literature. There has been very little research work done about which you can find out. I mean by that, What has been done has been done more or less by people who are not talking about what they have done. That is why as I say sometimes I have seen gums with very heavy finished solid which wouldn't have as much body as a gum with forty or fifty per cent as much finished solid.

Mr. Seltzer: Mr. Harris spoke, if I remember correctly, of the desirability of adding carbonate of potash in preparing the vat thickener after the mixture had cooled down somewhat, and if I remember rightly, the point brought out was that if added hot, or if added prior to boiling, and then boiling, the mixture became quite dark in color. I should like to ask Mr. Harris what in his opinion is the significance of the dark color developed in a case like that, and also the significance of the natural color occurring in other printing gum thickeners.

Mr. Harris: In regard to the vat gum, first, a good many colorists, especially in light shades, like to use as light a colored thickener as possible because if they do not get all the gum thickener washed out (and sometimes they won't), they feel that a dark colored thickener is liable to obscure the shade.

The potash if boiled in a thickener does act, I understand, to further convert any starches in there that are not fully converted, and in that process of conversion and boiling you break down some of your carbonate of potash. In other words, you won't have available in the finished thickener as much potash as you would think, from what you put in. That is, if you put in 15 per cent, based on the volume, you wouldn't have 15 per cent of available potash if you boiled your potash. But as a rule if they are working on an excess, that doesn't figure so much.

As far as the natural color in gums is concerned, I think that is largely due to the coloring matter that is present in the fine impurities which you get in a gum. You take a raw gum and it is a nice light yellow, or white gum, and you don't see any impurities there. But if you cook that up you will see all kinds of specks of dirt in there, and they are generally bark. Now, that bark gives a dye, colors the gum, and that is where most of the color in a gum comes from. If you could get gum that was absolutely free from all color you would get a lighter colored gum.

Then, again, I think part of the color is due to—take tragacanth, ribbon white tragacanth, or medicinal tragacanth. It is a beautiful white "trag." They tell me that

it is the first run of the sap. As you get down the line it gets yellower and yellower until you get what they call a "hog trag." That is as black as your hat, and that is the last run of the sap. There is no bark in there necessarily, but as the sap runs it seems the coloring matter gets darker. I have seen that on a cherry tree here. The first run is white. Later on as it runs out it gets darker colored and it is the natural color in that material that probably comes from the wood that gives you a lot of your color in a gum. I know most of the gum people are working to try to overcome that color.

Mr. Stewart F. Carter: Speaking of the prepared textile gums, you will notice that they are light colored when they are in the acid state. When you turn them over to the alkaline state you will find some of them darken. I have seen some of them go almost into a brownish grey.

Mr. Harris: Yes, they will blacken if you try to neutralize them with alkali.

Mr. Carter: Some more than others?

Mr. Harris: Yes.

Chairman Gaede: In other words, they act as an indicator?

Mr. Carter: Yes. (Laughter).

Chairman Gaede: Are there any further questions?

We have had a very interesting discussion tonight in regard to colloids, viscosity, surface tension, and body. I am sure we have gotten around the subject a great deal and we are certainly indebted to Mr. Harris for bringing out some of these things which a good many of us don't feel prone to talk about, things that will be developed further as we go along. As I say we are very much indebted to Mr. Harris for bringing out these points and delivering this paper and I will ask for a rising vote of thanks for Mr. Harris.

Upon motion regularly made, seconded, and carried, a rising vote of thanks was extended Mr. Harris.

Chairman Gaede: If there is nothing further to come before us the meeting stands adjourned.

The meeting adjourned at nine-thirty o'clock.

MARCH MEETING OF PHILADELPHIA SECTION

THE regular March meeting of the Philadelphia Section of the American Association of Textile Chemists and Colorists was held at the Elks Club, Camden, New Jersey, on Friday evening, March 27th, 1931, and took the form of a dinner meeting. At 7:00 P. M. eighty-one members and guests sat down to dinner.

At 8:30 P. M. the Chairman, Mr. Seibert, called the meeting to order.

Minutes of the previous meeting were read and approved as read.

Communication from the Secretary of the parent body in reference to publication rights of the Association to all papers presented at the meetings read. Communication in reference to the Philadelphia Section supplying a speaker for the next Annual Meeting also read.

Motion made and passed that arrangements be made for a meeting in the latter part of April as well as an outing meeting in May and that provision for these meetings be left to the Sectional Officers and Sectional Committee.

There being no further business Mr. Seibert then introduced Mr. Charles S. Rowe, who had spent considerable time in India, who then gave a most interesting informal talk concerning conditions and life in India.

Due to enforced absence of the next speaker, Mr. John R. Roberts, Mr. Seibert then read a prepared paper on the subject of "Paper—Its Manufacture and Uses," which was followed by a short discussion.

Meeting formally adjourned then to break up into group discussions and in the enjoyment by the members of the various facilities that the Elks Club has to offer, such as bowling, etc.

There were ninety-five present at the meeting.

Respectfully submitted,

PERCIVAL THEEL,
Secretary.

Paper—Its Manufacture and Uses

By JOHN R. ROBERTS

WHEN Mr. Seibert spoke to me about giving a talk on paper I said it was a dry subject and anything I might say would be dry. In spite of his remarks to the contrary I am still of the same opinion, but there are several interesting features connected with the manufacture and use of paper and these might interest you.

It may be somewhat legendary but we are told that man first conceived the idea of making paper from the wasp who gathers bits of wood and other vegetable matter, mixes them with the secretions of the mouth and makes a nest, the tissues of which are very much like paper. Be that as it may, we know that the first paper was made in China, probably before the beginning of the Christian era. In the earlier years of the industry cotton and hemp were the principal materials used and the paper was made in hand moulds—a slow and tedious process. It was not until 1803 that a machine to make a continuous web of paper was invented by Louis Robert and was first used in England by the Fuurdrinier Brothers. It received its name from them and is, in all its fundamentals, the same machine that is in use today.

Rags were used for many years as the base material from which nearly all paper was made. Considerable quantities are used yet and are prepared for use by dusting, cutting and cooking in alkaline liquors and then bleaching. They are used in blotting, high grade bond papers, and papers for special purposes. Paper made from rags is more lasting than that made from any other material and practically all records which are to be kept for several years or any great length of time are printed on rag paper. At the present time one of the large daily papers in New York City prints a limited number of each edition on all rag paper. These copies, which are kept for record, will still be in good condition when the ordinary ground wood sheet will have completely rotted away or become brittle, and have fallen to pieces.

It was not until 1840 that paper was produced commercially from wood pulp in Germany. The use of the cheap wood to replace the expensive rags grew rapidly and at the present time it is safe to say that 90% of all paper manufactured is made from wood. Wood is used in two forms, mechanical or ground wood and chemical wood. The first is usually spruce ground under pressure on huge grindstones, the product being short fibered and light yellow in color. This is wood pulp in its cheapest form and is the principal component of news print. One cord of wood will make approximately one ton of ground wood. Chemical pulp is produced by cooking chips of most any of the coniferous woods in various liquors which dissolve the encrusting gums and resins, leaving the wood fibers or cellulose. This is used unbleached in wrapping and other cheap papers and bleached in writing, bond, etc. A cord of wood will produce approximately 1000 lbs. of chemical pulp.

The extensive use of wood for the manufacture of paper has depleted the vast supplies of wood which were formerly in this country and still exist in Canada and Alaska. At one time the United States supplied all the spruce wood (the principal component of news print), but there are only a few acres left, comparatively speaking, in this country. The manufacture of news print has been transferred almost entirely to Canada, and although there are millions of acres of spruce in that country the Canadian government is already considering legislative action to conserve the supply.

Some of the large companies in the United States are carrying out a plan of reforesting their cut over lands so that in 30 to 50 years from now another cutting of logs will be available. In the meantime research is being carried on to develop other sources of cellulose for paper making. Paper has been made successfully from cornstalks, from the saw grass of Florida and from other sources of cellulose, but as long as the wood will produce the paper cheaper the other fibers will not be used.

At the present time spruce wood is being imported from Russia. The Russian wood is slow growth stock and is superior to wood grown in this country in strength, density and color. It will help to conserve the supplies on this continent if our government does not stop its importation on account of convict labor being used in its production or preparation.

In making the paper, the fibers, whether ground wood, chemical, or rag, are put, with water, into tubs called beaters which hold anywhere from 1000 to 3000 lbs. dry weight. Here the stock, as it is called, is mixed with the color, size (for waterproofing), alum and other ingredients and "beaten" or reduced to the condition to make the required sheet of paper. The paper machine consists of screens for screening dirt and slivers from the stock, a moving, endless wire screen, on which the sheet is formed, press rolls to remove water from the sheet, and a series of steam heated dryers for drying. The stock, mixed with a large volume of water (about ½% stock and 99½% water) goes through the screens and flows onto the moving wire screen. In traveling the length of the screen the water goes through, aided by suction boxes, so that by the time it reaches the other end of the screen the sheet is formed and is conducted from the screen through the press rolls. From these it goes through the dryers and then through finishing rolls onto the reel, as it is called, where it is wound up.

Heavy sheets such as boxboard are usually made on cylinder machines, the webs of paper being formed on several cylinders and then run together in the drying process. Up to seven and sometimes more cylinders are used and in this way it is possible to build up an extremely thick board.

Due to keen competition and the necessity of reducing cost of manufacture the small slow machines of a few years ago have been enlarged and speeded up until now there are machines making craft wrapping at the rate of over 1100 feet per minute and making a sheet around 20 feet wide. This is over a mile in five minutes and rivals the speed of the Camden-Salem express. One of these machines will produce over 6000 lbs. of finished paper per hour.

There are news print machines in Canada which run over 1000 feet per minute, are over 20 feet wide and make over 5 tons of news print per hour.

Another interesting feature is the amount of water necessary in the manufacture of paper. Large amounts of it are used in grinding, cooking, and washing the paper stock and in forming the sheet on the machine. Figures show that it requires the use of from 200,000 to 1,000,000 gallons of water for every ton of paper manufactured, the amount depending on the grade. Hence, the location of paper mills where there is an adequate supply of water.

We do not pay much attention to paper as it is common and we see it and use it every day. However, it is somewhat surprising to know that measured by the value

of its products it is the seventh industry in the United States. It employs over 120,000 wage-earners—enough to make a city larger than Wilmington. There are over 800 mills throughout the country and over 2000 paper machines in operation. In 1929, the last figures which I have available, there was a total of over 11,000,000 tons of paper manufactured in the United States, this being over 200 lbs. per capita. Of this total 30% was news print, 31% board, 12% book, 12% wrapping, 4% fine papers and all others 11%.

You might wonder where this large amount of paper is used. It might be interesting to know that each week the Saturday Evening Post uses over 4,000,000 lbs. of paper, which amounts to something like 50 carloads. It takes 3 large, fully equipped paper mills running over a dozen large machines to supply this one item.

The Evening Bulletin in Philadelphia uses nearly 200 tons of news print every day for its various editions, and the bulky New York dailies require even more. Safety razor blades are small affairs but Mr. Gillette is authority for the statement that it requires 1200 lbs. of waxed paper per day to wrap the daily output of razor blades and an equal amount of cellophane—a product made from wood fibers by a special process.

Cellophane, the transparent product used to wrap high grade candy and other similar products, is really paper as it is produced by dissolving spruce wood fibers in chemicals and converting the solution into dry sheets. It is the same solution used to produce rayon or artificial silk, the only major difference being that in the latter case the solution is converted into fine threads. The use of moisture proof cellophane is rapidly expanding as a wrapper for candy, cigars, cigarettes, meats and food stuffs.

It might be of interest to know that large tonnages of unsized rag paper are used for radio panels and other Bakelite products. These are laminated, many sheets of paper being run through an alcoholic solution of condensite, and pressed together under a pressure of 2000 lbs. per square inch and a temperature of 300° F., the finished product being hard, glossy, water-resistant and a non-conductor of electricity. Many radio sets are made up with panels of this material. The product is also used for table tops, bath room walls, etc. The same material is made up into the quiet fiber timing gears for automobiles and gears for other machinery.

The same paper is treated with zinc chloride and made into vulcanized fiber which is used for insulating around switch boards and other electrical machinery. The same paper treated by still another process produces artificial ivory and other products of like nature.

It will be remembered that 31% of the 1929 production was board. Years ago nearly all shipping of groceries was in wooden boxes, but as lumber became higher priced and paper board cheaper shipping containers were gradually changed over to paper board. At the present time many large board mills turn their entire production over to container board for use in shipping such products as Van Camp's beans, the Heinz products, Loose-Wiles biscuits, and a host of other nationally used table articles. One mill in Philadelphia has a daily output of 1,000,000 lbs. of container board.

It might be mentioned that container board creates a market for all the old newspapers and other waste papers which the junk man collects. The inside layers of container board are composed principally of waste papers which are bought by the mills in carload lots. The outside layers are composed of new strong pulp which gives the board its strength.

Large tonnages of paper are converted into furniture and rugs. In the manufacture of furniture the paper is cut in strips and run through twisting machines, being sprayed at the same time with a sizing or glue solution. The twisted strands are then woven over wooden frames into furniture and varnished, the finished product being very substantial and long lasting.

Rugs are manufactured in much the same way except that the twisted strands are smaller and more pliable and held together by warp. They may be colored any desired color and be very serviceable.

One large manufacturer of paper has developed a sheet called Mulch paper which is being used in enormous quantities. Strips of the paper are laid between the rows of vegetables or anything grown in rows, conserving the moisture in the ground and preventing the growth of weeds.

It would not seem that it would require a large tonnage of paper to supply the envelopes of the country, but one mill alone in 1929 had a contract to supply the U. S. Envelope Co. with 12,000 tons of envelope stock. This means that this one company alone converts 1000 tons of paper into envelopes each month.

You are all familiar with bond papers, for example, Hammermill bond, and with glassine—for instance the outside wrapper of some cigarettes. It might interest you to know that these are made of exactly the same stock, bleached sulphite, the difference in the sheets being produced entirely by different treatment of the stock and different finishes given to the sheets.

At the present time considerable paper is being converted into artificial leather. The process consists of introducing Latex into the sheet, the resultant product being very strong and pliable. When colored and embossed, it resembles leather very closely and is used for book bindings, etc. Work is being carried on to perfect the product so it can be used for the uppers of shoes and if successful will open up another large field for the use of paper.

Among the new and unusual purposes to which paper is being put might be mentioned milk bottles, cement

bags, and insulating paper for underground wires. It is believed that in time paper milk bottles will be perfected to the point where they will entirely displace the glass bottles.

The large Portland cement manufacturers are gradually changing from cotton bags to paper. The latter are cheaper, fully as serviceable, and are intended to be used but once, while the cotton bags have to be collected after use, and returned to the factory. This one item alone will increase paper production thousands of tons per year.

At the present time hundreds of tons of paper are converted to the insulation of underground cables. The paper is made very tough and pliable, then passed through asphalt and wound into tubes of any desired diameter. It has been found that this material is more serviceable and cheaper than rubber, which was formerly used.

A word about paper and education. Before paper came into use it was hardly possible to distribute education by the printed word. As paper became more plentiful the distribution of knowledge became easier until now one may read all the current events and the news for an expenditure of 2c per day. A liberal education and considerable fiction is supplied by two or three 5c weekly magazines, the price of which does not usually cover the cost of the paper used, and all the knowledge of the age is available in nominally priced books. All of this would be impossible were it not for the product called paper.

FEBRUARY MEETING OF PHILADELPHIA SECTION

THE regular February meeting of the Philadelphia Section of the American Association of Textile Chemists was held on Friday evening, February 27th, 1931, at the Engineers' Club of Philadelphia. The meeting proper was preceded as usual by an informal dinner with twenty-three present. The meeting proper was called to order by Mr. E. C. Bertolet, who acted in the absence of the Chairman, Mr. Seibert and Vice Chairman Mr. Stringfellow.

Minutes of previous meeting read and approved as read. Under unfinished business action was taken on the proposed amendments of the local by-laws so that Sectional Officers should be nominated at the next to the last spring meeting of each year and elected at the last meeting in the spring. After due discussion the proposed amendment was adopted, by vote.

After due motion and seconding, motion that present officers be continued in their respective offices until the Spring of 1932 was passed.

There being no further business to come before the meeting Mr. Bertolet then introduced Mr. Richard S. Cox of the Philadelphia Textile School, who addressed the section on the subject of "Color and Its Applications in Textiles." Following a brief discussion Mr. John Otterson of the DuPont Experimental Farm gave an informal talk of the work being undertaken here in the raising or propagation of wild game and followed this by showing several reels of wild life, fishing and hunting.

Following the showing of the pictures Mr. Stringfellow spoke of the plans of the March meeting, which is to be held at the Elks Club, Camden, N. J.

Meeting adjourned at ten fifteen. Thirty-three present.

Respectfully submitted,

PERRCIVAL THEEL,
Secretary.

MEETING OF NORTHERN N. E. SECTION

THE Northern New England Section met at Riverbank Court Hotel, in Cambridge, on Saturday evening, March 7. Thirty-nine were at dinner and forty-two at the meeting.

Chester C. Stewart and Victor Wichum of the C. J. Tagliabue Manufacturing Co. spoke on "Automatic Temperature Control in the Textile Industry."

At the next meeting, on April 4, the speakers will be Dr. Olney, and John J. Healy, Jr., of the Merrimack Chemical Co.

Respectfully submitted,

HAROLD C. CHAPIN, *Secretary.*

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WORKING PROGRAM FOR INDUSTRY

A WORKING program for New England industry in 1931 consisting of fourteen recommendations made by 739 leading New England business executives has been issued by the Industrial Committee of the New England Council.

Hundreds of New England business executives were asked to recommend the steps which, in their opinion, should be included in a practical and ideal working program for any New England industry during the present year. Replies were received from manufacturers, public utilities, railroads, department stores, hotels, insurance companies, trade associations, chambers of commerce, communities, newspapers, business publications, state governments, and members of the New England Council. The replies were analyzed and the results compiled by the Council.

The first recommendation which was made by 534 executives is to "hold lay-offs to a minimum" by eliminating overtime and then if necessary by reducing weekly hours. It is better to provide half-time work for the full force than to provide full-time work for half the force and allow the other half to become unemployed, according to the executives.

Aggressive merchandising is urged by 501 executives, and constitutes the second recommendation. Under this heading it is suggested that past sales be analyzed for the most profitable lines, customers and territories, and that selling efforts be concentrated on them. Improved quality, better packaging, the development of new uses for present products and of new products to meet new conditions, are among the steps included in this recommendation.

"Improve employe morale" 448 executives declared in their ballots. This, it was suggested, could be done by keeping employes informed regarding the progress of the company's efforts for the maintenance of steady work for them, and maintain wages and working conditions on a level that enables the employe to prosper as well here as elsewhere.

Other recommendations include those to encourage normal buying for normal needs by those with a steady income, to clean up, paint, repair and do general "house cleaning," to overhaul machinery and equipment, to adopt research, to develop plant modernization programs, to invite employes' suggestions, as to the elimination of waste, to plan and budget profits, sales and production, to establish adequate standards of quality, value, and performance, with suitable incentives and rewards for attainment and maintenance; to cooperate with the community in registration of unemployed with regard to relative need for work, to encourage accurate local publicity on local business conditions and the extent of employment as the first step in maintaining confidence in local industries, and to encourage exchange of information between New England communities on opportunities for work in order to avoid excessive and unwarranted travel expenditure by labor "hunting jobs."

STRENGTH OF BRITISH CHEMICAL INDUSTRY

The strength of the British chemical industry, built up in recent years, enabled it to come through 1930 in a better position than the majority of British industries, according to a survey made by Trade Commissioner Roger R. Townsend which the Commerce Department has just released. Since the industrial disturbance in 1926, he points out, the chemical industry of the United Kingdom had made consistent progress up to the end of 1929.

The index of production for chemical and allied trades during the first three-quarters of 1930, the survey shows, revealed a marked decline from the averages of the two preceding years. It was also substantially below the general index for all manufacturing industries in the 1930 period, whereas in the two preceding years the chemical index had been slightly above the general index.

Unemployment in the chemical industry increased in 1930 at a more rapid rate than in British industry as a whole. Notwithstanding this development, the percentage of unemployed in this industry, although it had doubled during the year, was still not as high as that for the entire country.

Referring to foreign trade, Trade Commissioner Townsend's report shows that the United Kingdom maintained its favorable chemical trade balance last year, with an excess of exports amounting to more than $11,000,000. Imports of chemicals into the country in 1930 had a value of $114,000,000, while the figure for exports was $125,000,000. One phase of the British foreign trade in chemicals of outstanding interest was the marked decline in re-exports which last year amounted to less than $9,000,000, a figure lower than the prewar volume. The less-

ened foreign demand for British chemical products was most pronounced in some of the best foreign markets. Shipments to the United States and the overseas empire countries were restricted in 1930, while the continuance of disturbed conditions in the Far East, especially in India, also had an adverse effect.

Concluding his study, Trade Commissioner Townsend declares that the year 1930 was one of consolidation rather than expansion. The Imperial Chemical Industries, the largest single unit of the British industry, led the movement in concentration by removing several of its plants to Billingham.

German Chemical Trade

Germany's total exports of chemicals during 1930 were $281,550,000 compared with $326,700,000 for 1929. The total chemical imports for the corresponding years were $61,560,000 and $76,301,000 respectively. The chief chemical exports during 1930 were inorganics $59,500,000, coal tar dyes $46,650,000, nitrogen fertilizers, $45,200,000, pharmaceuticals $29,036,000, and mineral colors and paints $23,500,000. The chief export markets in 1929 were United States, Austria-Hungary, Netherlands, Japan, and Great Britain. (Trade Commissioner William T. Daugherty, Berlin.)

Exhibit of Emulsions

The Chemical Industries Exposition to be held at Grand Central Palace, New York City, during the week of May 4th will have a unique exhibit sponsored by the Glyco Products Co., Inc. It will not only be an exhibit of new and novel raw materials and finished products but it will be educational as well.

During recent years great interest has been manifested by chemists and technicians in emulsions as applied industrially. Emulsions are now being used in water-proofing, lustering, polishes, disinfectants, deodorizing sprays, lubrication, cleansing, water-colors, inks, etc. In order to illustrate the proper technique in making emulsions, technical representatives will be present at this exhibit who will prepare many different emulsions. They will be glad to consider any emulsion problems which may be presented.

Clemson College Textile Adds New Assistant

Mr. F. Albert Sauter has been added to the present staff of Clemson College Textile School as laboratory assistant. Mr. Sauter holds a B.S. degree from Rutgers University, 1928, has taught general chemistry for two years and has taken graduate work in textile chemistry at Columbia University. He has spent some time in studying the practical aspects of silk dyeing and finishing in New Jersey.

While acting as laboratory assistant, Mr. Sauter is making further study of printing and dyeing in the Textile Department of Clemson College.

Booth of U. S. Testing Co.

The Booth of the United States Testing Company, Inc., at the Knitting Arts Exhibition will serve chiefly as a field office where the trade can secure information, technical or otherwise, regarding the Company's services and facilities. The Thrown Silk Test will be especially stressed and the apparatus used in making it will be exhibited. In attendance will be Allan L. Brassell, Sales Manager; Geo. W. Fiss, Jr., Manager, Philadelphia Testing House; Joseph A. Woodhead and Stuart B. Walker, Sales Engineers, and others of our staff.

Chromoxane Cynanine R

Chromoxane Cyanine R is a new brand offered by the General Dyestuff Corporation for the dyeing of wool, according to the Chrometopped method. It is said to produce bright reddish blue shades distinguished by their very good fastness to washing and fulling, water, saltwater, perspiration, decatizing and stoving. In fastness to light it corresponds with the other brands of the Chromoxane series. Chromoxane Cyanine R is also recommended for Vigoureux printing. I. G.-441.

Unique Sample of Weaving

Visitors to the exposition building in Anderson, S. C., in which the exhibits of the Southeastern Cotton Festival are being displayed have expressed pleasure at an array of fabrics from the Clemson College Textile Department. Each fabric in the collection was designed and woven by a student or group of students as a class project in the laboratory of the Weaving and Designing Division. Many of the fabrics are made entirely of cotton, while others are made of cotton in combination with other fibers.

An outstanding piece of work in this display is a likeness of Dr. E. W. Sikes, President of Clemson College, woven into a fabric. This unique piece of work, composed entirely of black and white threads, required considerable time and skill, it having been perfected over a period of several years.

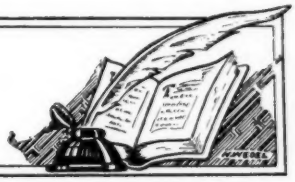
Hercules Nets $2,160,260 First Nine Months

Net profits of $2,160,260 for the nine-month period ending September 30 is reported by Hercules Powder Company. After payment of regular preferred dividends there is available for the period $2.59 per share on 603,079 no par common shares. Gross receipts were $20,416,664 as against $25,612,545 for the first nine months of 1929 when earnings were $4.41 per common share.

The statement shows a sound financial position, surplus September 30 standing at $13,765,737 and cash and securities of over $8,000,000 being listed. Work on the company's new laboratories at Wilmington is moving ahead rapidly.

The use of Cellophane as a modern packaging material for textile products was featured in a Boardwalk window display at the DuPont Exhibit in Atlantic City.

Technical Notes from Foreign Sources



Vat Dyestuffs (Sulphur?)

German Patent No. 453,086 (*addition to G. P. No.* 379,615 *of* 1921)—*Leopold Cassella and Co.* (10, XI, 1927)—Merely an extension of G. P. No. 739,615 and 382,928, consisting of fusion of various aromatic amines (diamino-compounds), with 2-methyl-anthraquinone and sulphur, instead of simply p-diamino-compounds. The products of this group are deeper in tone (greenish-yellow to orange) than the yellow dyestuffs of the above two patents. The products are vatted in hydrosulphite.

Mordanting and Dyeing Silk for Blacks

Dr. M. Marchionesi—I Progressi nelle Ind. Tint. e Tess. 29, 242 (1930).—An article of practical aspect, dealing in detail with the four methods of dyeing unmordanted silk; (a) dyeing and mordanting in a single bath, (b) premordanting with tin salt, (c) premordanting with iron salts, (d) mordanting with both tin and iron salts. The mordants referred to are stannic chloride, basic ferric sulphate, pyrolignate of iron, stannous chloride, and ferrous sulphate. The paper is continued; in this section only methods a and b are taken up.

Silk-Weighting and Increase in Volume

Dr. P. Heermann u. Dr. A. Herzog—Seide 35, 193 (1930).—The paper, although brief (because succinctly written), is of importance. One of the authors (P. H.) has already done much work upon the relation between silk weighting and swelling of fiber, carrying out measurements of fiber thickness, and deducing cross-sectional area and increase in volume from these measurements. At the time, it was of course recognized that the cross-section of silk is not truly circular, but variable to a considerable degree; but as the silk fiber does not possess a band-like structure, and so we cannot speak properly of the broad and the narrow side, as in the case of cotton, the assumption was made that the measurements spoken of could be used as approximation, and that a sufficiently large number of them could afford a good average value, since in a large series of measurements the "law of averages" would suggest that the broad and the narrow sides of a collection of fibers would come up for measurement in about equal numbers. In accordance with this thought, the swelling value for a series of technical weightings was calculated from the diametric values.

At the time, it was foreseen that these diametric measurements would require to be checked up by exact measurements of cross-sectional area at some convenient time—a very difficult and tedious task. This work has been carried out by the second author, Prof. Herzog, whose skill in such work is well known. The results were in some cases so astonishing, that they were at first felt to be totally incorrect, but repeated measurements only confirmed the first figures. It appears that silk fibers which do not possess an exactly circular cross-section do assume a position on the microscope slide upon their flatter side, in most cases, so that our measurements of thickness of fiber are as a whole considerably too large. Five cuts are given, showing cross-sectional views of five samples of silk in various conditions; and while, of course, none of the outlines are really angular, nor possess really "flat" sides, except rarely, yet nearly all can be looked upon as rather flat upon at least one side; the outlines are what one would get by manipulating plastic circles, ovals, triangles, quadrangles, etc., rounding off the corners and more or less distorting the sides inwardly.

The results of these new measurements, of course, is to show that the figures for increase in volume under weighting are essentially smaller than as has been stated. They can now be of value only for comparison, in a relative way.

Immunized Cotton

"Chemtex"—Text. Argus 7, 309 (1930).—The full title of the above article is "Chemical Research Applied to Cotton; Some Observations on Immunizing Processes." It is an interesting sketch of the various methods of chemical modifications of cotton as such, as contrasted with regenerated cotton (as viscose). It contains no definite data, or the like, but is a clear and well-handled discussion of the subject from the textile-chemical side.

As to cotton immunized before dyeing, Meister Lucius and Bruening, about 25 years ago, patented a process for making cotton inert toward direct dyestuffs, by treatment of it with glacial acetic acid. The results were poor, and nothing ever came of the process. Immunized cotton, as we now generally understand the term, is an ester of cellulose, produced by treating cotton first with alkali, to form alkali cellulose, and then with an acid chloride, to form the ester; usually the chloride of an aromatic sulphonic acid. Para-toluene sulphonic acid chloride is the chloride which has usually been employed, since it is available in considerable quantities ready-made, so to speak, as a byproduct from the saccharine industry. Such esterified cotton is harsher in feel, and a little less lustrous, than untreated cotton. "Reserve Cotton," a Continental development, is produced by treating cotton, in a bath of caustic soda or soap and Turkey-red oil, with benzoyl chloride. Either of these products, and all similar ones, would be liable to de-esterification under proper (the dyer would say, under improper) conditions, but the esters of sulphonic acids are little liable to this effect

in the cold, at least. Cotton has also been acetylated, by means of glacial acetic acid, acetic anhydride, and a catalyst. This product is called "Cotopa," or, if the cotton has been mercerized before acetylation, "Crestol." The acetylation is not allowed to go beyond the diacetate stage; and as at this point the product is not soluble in the excess of reagents employed, the product retains its original physical form, and its strength and elasticity remain unaltered. It is softer in feel, and more flexible, also is pure white in color, as compared to ordinary immunized cotton. It is, as mentioned above (general statement), sensitive to alkalies, especially in the heat. It can be mercerized, however, successfully, and the product is of high value. Such a fiber does not display affinity toward direct cotton colors, but does toward basics; and, if the direct colors happen to be shaded with basics, as is sometimes the case, the whites will be at least stained. Sulphur dyestuffs also are inert toward acetylated cotton, but, as they are used in alkaline bath, the bath temperature should not go above 40° C., in order to avoid hydrolysis of the ester and regeneration of the cotton, which would then take up the sulphur dyestuffs; and Glauber salt must also be added to the bath, to help to exhaust it at the lower temperature of dyeing.

Immunized cotton is liable to blackening on too hot ironing, owing to sulphuric acid being set free from the sulphonic ester by pyrogenic decomposition.

In contrast to cellulose acetate, acetylated cotton is stronger when wet than when dry. Further, dyed cotton yarn may be successfully acetylated, provided that dyestuffs have been used which will not change in shade or tone themselves, also, when acetylated. It has been observed that cotton, dyed with direct colors, and then acetylated, forms a product whose color is more fast to light, washing, and bleaching, than the original dyeing. (This is not really surprising, for the acetylation of such dyestuffs takes place upon the free amino or hydroxyl groups which are practically always present, and these groups are well known to make a compound, in which they are found, more sensitive to chemical attack, at least, while acetylation diminishes this sensitivity). Yarns so treated increase in thickness by about 20 per cent. Since there is usually a lightening of shade involved, dyeings would have to be deeper than the shade required for the finished goods.

As to printing—cotton goods may be printed with caustic soda and a suitable thickener, and then passed through a warm immunizing bath, containing either a sulphon-chloride, carboxyl chloride, or anhydride, depending upon which type of immunization is desired. The reaction is rapid; the goods need only soaping, to remove thickener and unused reagent. Such locally immunized goods can be dyed in two-color effects, by single or two-bath processes, or the immunized parts may be left white. This latter procedure is of peculiar value; for the whites will not stain in washing, through bleeding from the surrounding colored areas; whereas white patterns produced upon ordinary cotton by printing a discharge upon a dyed ground are white enough at first, but on washing are generally ruined by bleeding.

Amidated cotton, a derivative of immunized cotton, is of great promise, though not yet upon the market. It is prepared by treating immunized cotton with ammonia or some organic base. The product still looks like cotton, even under the microscope, but chemically it shows itself to be a new fiber. Work is still being done upon the various methods possible in its synthesis. The product shows strong basic properties, and so its dyeing properties are just opposite to those of esterified or immunized cotton. It behaves exactly as does wool, in taking up acid dyestuffs from a neutral or weakly acid bath. Such dyestuffs take so vigorously upon amidated cotton that they are much faster to washing than when applied to wool; and require care during dyeing, lest they go on so rapidly as to produce uneven dyeings. When wool and amidated cotton are dyed in the same bath, the latter seizes upon the dyestuff so greedily that the wool is hardly tinged when the amidated cotton is dyed almost to its limit.

Dyeing Indanthrenes upon Artificial Silk and Cotton with Good Levelling

O. Sanner—Monats. f. Textil-Ind. 45,213 (1930).—To dye cotton, whether mercerized or raw, as well as artificial silk, with Indanthrenes, and get the goods out dyed evenly, requires experience and intelligent, exact work. With artificial silk, as with cotton, a thorough wetting-out and swelling of the fiber must precede dyeing. Artificial silk is to be wetted out at 50°C., with addition of 5 per cent of the weight of the goods of Supralene, cotton to be wetted out similarly at the boil; then rinsed, before the dyeing is begun. In general, the temperature is to be kept as low as possible in the dyeing. The thoroughly vatted and perfectly dissolved dyestuff is added to the bath in several portions. If one is dealing with goods which are difficult of penetration, as Cordonettes, etc., thick cotton cording, thicker portions of variable weaves, and so on, it is of no use to force the temperature higher, but, rather, the dyeing is interrupted; that is, for a 2 per cent light blue dyeing with Indanthrene Brilliant Blue 3G, we dye with 1 per cent of the dyestuff, make ready the goods for a second vat, enter the dry goods again into the old bath, and dye again with 1 per cent more of the dyestuff.

It may be objected that this double manipulation is too expensive; but it may be pointed out that it is better to avoid difficulties than to run into them with one's eyes open, and that there is no other way, as experience will show, to dye through hard material than in such a manner (despite any possible additions to the bath) as described above.

The addition of caustic soda or caustic liquor, as well as of hydrosulphite, must be carried out very exactly, according to the quantity of bath. Too much or too little is unfavorable. The total amount of hydrosulphite, as with the dyestuff, is to be added to the bath in several

portions, it being always understood that the bath is steadily alkaline, i.e., that the dyestuff is being steadily reduced. The additions to the dyebath, outside of the hydrosulphite, and caustic, are sulphonated oils. The preparations called Decol and Chefadol slow down the rapid taking up of the vat by the goods. Tetracarnite, etc., assists the penetration of yarns or piece goods. Other similar preparations are useful for promoting a rapid penetration of the bath through the goods at the beginning of the dyeing process. Glue also favors a slower taking up of the dyestuff solution by the fiber, and has in addition the advantage of exerting a protective influence upon the fiber, a point which is carefully to be considered in view of the presence of strong caustic in hot baths.

A good, hot-dyed artificial silk dyeing with Indanthrenes is always of smoother character than one dyed cold. It is obvious that no part of the goods should lie around over night without having been washed, for very serious trouble is easily caused by neglect of this point; the fiber becomes rough and scurfy, the dyebath still present in the goods soaks down to the under parts and dyes those portions still further, and it is never possible to get a satisfactory evenness in the finished goods, even if they are dyed over again in the morning.

After dyeing, the goods are rinsed twice cold and once or twice hot, in 20 times the weight of the goods; a hanging up to drain, or a neutralization with acid, is unnecessary, though often carried out; it serves no useful purpose, and delays the work. After the hot rinsing, the soaping follows, with 4 per cent of Marseilles soap. The lighter green tones change decidedly in shade toward a blue, under a hot soaping, therefore these colors are not soaped at the boil, but at only about 60°C. In all dyeings which are over 12 per cent of dyestuff, a second soaping is advisable, to increase their fastness.

A procedure for a Nile Green for 100 kilos of artificial silk would be as follows: pretreatment with 5 kilos of Supralane, then dyeing with the following:

600 g. Indanthrene Brilliant Green B in paste, well dissolved and added in 3 portions

14 liters Caustic soda liquor of 40°Bé.

5.5 kilos Hydrosulphite conc.; the first bath treated with 4.5 kilos, and with each addition of dyestuff about 0.5 kilos more of hydrosulphite

2 liters Newalol, 6 liters Decol, 1 liter Triumphoel, 1 liter Flerhenol.

Goods are dyed cold for 1 hour, washed cold twice, once hot, soaped at 60°C. with 4 kilos of Marseilles soap, and oiled with 1 per cent of olive oil, 1 per cent Avirol SM 100, and 1 per cent Triumph-avivage (rather a formidable list of special proprietary preparations, probably all of which are duplicated in their effects by American products of the wetting-out or sulphonated oil groups).

The skein of silk accompanying the article is a handsome dyeing.

Some Remarks upon Washing-Powders and Washing

Albrecht — Seifen-Sieder-Ztg. 1929, *S.* 168 (*Dr. J. Davidsohn, Monats. f. Textile-Ind.* 45,209 (1930).—The question is often asked, why, in general, the washings which are handled in commercial laundries go to pieces more rapidly than those which are done at home, even when the laundry uses no "bleach." The question has been answered tentatively in several ways. The author is of the opinion that bleaching agents, which are usually blamed for the rapid deterioration of the goods, does not attack the fiber, if properly used. He believes that chemicals, such as perborate, hypochlorite, etc., are not at all necessary in most cases. If clothing soiled in certain occupations (chemists, physicians, etc.) come into consideration, then chlorine, in the form of bleaching powder or hypochlorite, is properly and effectively used, but should be followed by an anti-color.

The author distinguishes between washing-powders and soaps, which two classes of compound are now-a-days carelessly confused. A washing-powder in the strict sense is not a cleansing agent, but a softening agent, which should be previously added to the water in which the goods are to be soaked, for at least 12 hours before the washing proper. A washing-powder, which contains only soda and pure soap, in the correct proportions, greatly increases the "loosening" effect of water upon oily matter upon the goods, and also decreases any possible hardness of the water. After such a soaking and softening, the washing itself is easily carried out with a good soap, any vigorous scrubbing on washboard or with brush is not necessary; only an ordinary working of the material by hand is enough to give a snow-white washing.

The author considers the use of water-glass to be the chief cause of deterioration in the goods; water-glass, that is, which has been added to the soap during its manufacture; and speaks strongly against the practice of loading soaps with either water-glass or even soda, beyond a certain allowable point.

Fine Viscose Fibers

German Patent No. 440,227 (*addition to G. P. No.* 308,427 of 7/IV/'18) — *Verein Glanzstoff-Fabriken, Elberfeldt* (1/II/'27). — French Patent No. 461,900 specifies for the production of fine viscose filaments a precipitating bath containing ammonium salts and acids, either organic acids, or hydrochloric acid in considerable excess over what is necessary to neutralize the ammonia set free in spinning. The present patent specifies a saturated solution of an ammonium salt (the French patent referred to does not specify a saturated solution), and only a small amount of a mineral acid. It is claimed that fibers spun in such a bath are clear, of good tensile strength, of perfectly circular cross-section, non-coherent, and capable of taking dyestuffs evenly and well. Further, it is stated that the method is not particularly sensitive to the degree of ripening of the viscose solution.

Marvin Appointed Hercules Advertising Manager

Theodore Marvin was recently appointed advertising manager of Hercules Powder Company.

Marvin, who has been assistant advertising manager and editor of The Explosives Engineer magazine, assumes the post vacated April 5 by the death of Nelson S. Greensfelder.

The new advertising manager has been an employe of Hercules Powder Company for eight years. A graduate of the Colorado School of Mines, he became in 1923 associate editor of The Explosives Engineer, published by Hercules Powder Company, and in 1925 became its editor. In 1929, he was appointed assistant advertising manager.

Marvin has been active in both the advertising and technical publicity fields and is the author of handbooks on mining and tunnel methods. His appointment becomes effective immediately, according to official announcement.

Mr. James F. Walsh, formerly Vice President and Technical Director of Celluloid Corporation, has joined the consulting staff of Arthur D. Little, Inc., of Cambridge, Massachusetts.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, OF AMERICAN DYESTUFF REPORTER, published every other week at New York, N. Y., for April 1, 1931.

State of New York, County of New York, s.s.:

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Alfred P. Howes, who, having been duly sworn according to law, deposes and says that he is the Publisher of the AMERICAN DYESTUFF REPORTER, and that the following is, to the best of his knowledge and belief, a true statement of the owner-ship, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Name of—— Post office address——

Publisher—Alfred P. Howes, 440 4th Ave., New York, N. Y.
Editor—Louis A. Olney, 440 Fourth Ave., New York, N. Y.
Managing Editor—Bliss M. Jones, 440 Fourth Ave., New York, N. Y.
Business Manager—William Howes Collins, 440 Fourth Ave., New York, N. Y.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.)

Owner: Howes Publishing Company, Inc., 440 Fourth Ave., New York, N. Y.
Stockholders:
Alfred P. Howes, 440 Fourth Ave., New York, N. Y.
Mary K. Howes, Rutherford, N. J.
Cecile R. Howes, Rutherford, N. J.
James T. Howes, Rutherford, N. J.
Derfla C. Howes, Rutherford, N. J.
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Louis A. Olney, Lowell, Mass.
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Derfla H. Collins, Upper Montclair, N. J.
William H. Collins, Upper Montclair, N. J.
Jos. L. Schroeder, Hartsdale, N. Y.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.)

None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowldge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is.....(This information is required from daily publications only.)

ALFRED P. HOWES, Publisher

Sworn to and subscribed before me this 28th day of March, 1931.
(SEAL) CAROLINE ESSENBREIS
(My commission expires March 30th, 1931.)

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i.e., help wanted, machinery or supplies for sale—the rate is $5.00 per column inch or less per insertion.

POSITION WANTED

Secretary-Stenographer—8 years' experience with importing and domestic Chemical and Dyestuff manufacturing concern, desires a position in similar capacity wherein excellent knowledge of sales operations may be of service. Address: Classified Box No. 668, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

POSITION WANTED

Executive Chemist—German graduate; fifteen years' experience intermediates, Dyestuffs, etheric oils, former executive abroad; five years with American dyestuff corporation, wishes position as research and plant chemist or technical adviser to executive. Would consider temporary connection for special research problems. Address: Classified Box No. 669, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

POSITION WANTED

Textile Colorist for 12 years, selling soluble oils, dyestuffs and specialties, desires position with manufacturer or in purchasing department of textile mill. Address: Classified Box No. 670, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

POSITION WANTED

Graduate Textile Chemist—24, single, desires employment of any nature in print works, bleachery or dye house. Willing to do anything. Salary of secondary consideration. Some experience in laboratory of print works; former instructor of textile chemistry and dyeing. References. Full information on request. Address: Classified Box No. 671, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

POSITION WANTED

Recent Textile Graduate (Southern) desires to make a change. Can prove his worth to a company recognizing initiative and effort. Address: Classified Box No. 672, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.